

Naturalis Energy Developments Ltd

**Mynydd Fforch Dwm
proposed wind farm and solar array**

Environmental Statement

November 2023



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1 Introduction

1.1 Introduction

- 1.1.1 Naturalis Energy Developments Ltd ('the Applicant') has submitted an application to Planning and Environment Decisions Wales (PEDW) seeking consent for a Development of National Significance (DNS).
- 1.1.2 The proposal is for the construction and operation of six electricity generating wind turbines, a solar photovoltaic array and associated infrastructure in a location approximately 6 kilometres (km) to the east of Neath and 1 km to the north-east of Tonmawr. The location and the extent of application Site is identified by the red line shown on Figure 1.1. In total, the Site covers an area of 290 hectares (ha) within the administrative area of Neath Port Talbot County Borough Council (NPTCBC).
- 1.1.3 The Proposed Development is named the Mynydd Fforch Dwm Wind Farm & Solar Array (MFD). It comprises an electricity generating station with an installed capacity of more than 10 MW and therefore falls within the definition of a DNS as defined by Regulation 4a of the Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016, for the purposes of section 62D of the Town and Country Planning Act 1990.

1.2 Environmental Impact Assessment

- 1.2.1 This Environmental Statement (ES) accompanies the DNS application for MFD. The ES is prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended) ('the EIA Regulations'). A separate Non-Technical Summary (NTS) provides a summary of the main findings of the ES.
- 1.2.2 Environmental Impact Assessment (EIA) is a process that formally considers the construction and operational aspects of a proposal that may have significant effects on the environment. The findings of an EIA are described in a written report known as an Environmental Statement. An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to mitigate adverse effects: information that is taken into account in the planning decision.
- 1.2.3 An EIA has been undertaken for the Proposed Development described in Chapter 4 and illustrated by the accompanying Figures. Subsequently, when PEDW is considering the application, it has knowledge of environmental effects predicted, and take this into account in the decision-making process.
- 1.2.4 The EIA is based upon an EIA Scoping Direction that was received from PEDW on 24th June 2022 (Reference: 3255801), a copy of which is provided at ES Appendix 3.2. It also takes into account the comments received in feedback from the Pre-Application Consultation process that has been undertaken in accordance with the requirements set out under Articles 7, 8, 9 and 11 of The Developments of National Significance (Procedure) (Wales) Order 2016 (as amended).

1.3 Environmental Statement Structure

1.3.1 This ES comprises the Main Report (Volume 1), Figures (Volume 2), supporting Appendices (Volume 3), and a separate NTS. Following this introduction the ES Main Report is organised into following chapters:

- 2 Site Description
 - 3 Scoping, Consultation and Methodology
 - 4 Scheme Description, Alternatives and Design Evolution
 - 5 Policy Context
 - 6 Aviation, Telecommunications, Shadow Flicker and Safety
 - 7 Landscape and Visual
 - 8 Noise and Vibration
 - 9 Ecology
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1.3.2 Chapter 2 provides a description of the Site and its surroundings. Chapter 3 sets out the scoping and consultation that has taken place, as well as the approach taken to the assessment. Chapter 4 explains each element of the Proposed Development and the design evolution, which, with figures listed in Paragraph 4.2.3, defines the physical and operational aspects assessed by the EIA. Chapter 5 sets out the planning policy context for the development proposed.

1.3.3 Environmental issues assessed in the EIA process are then reported in Chapters 6 to 14, with the majority of associated figures provided as separate files in ES Volume 2 (PDF), although some are set within the text of the Chapters. Chapter 15 provides a summary of the proposed mitigation, and identifies residual effects, including potential interaction effects.

1.4 The Project Team

1.4.1 The consultancies working on the scheme design and EIA of the Proposed Development are as follows:

- Savills: EIA co-ordination: introduction and summary;
- Stephenson Halliday: Landscape and Visual;
- Pell Frischmann: Transport and Access;
- Avian Ecology: Ecology and Ornithology;
- SLR Consulting: Geology, Hydrology and Hydrogeology and Peat, Archaeology and Cultural Heritage, Shadow Flicker;
- Hoare Lee: Noise and Vibration;
- Pager Power: Telecommunications and television;
- Wavehill: Socio-economics; and

- WPAC: Aviation.

1.4.2 The EIA has been coordinated by Savills with the technical assessments and input undertaken by the project team. An outline of the qualifications/experience of the assessors to demonstrate competency in accordance with the EIA Regulations is provided in Appendix 1.1.

1.5 Provision of Environmental Information

1.5.1 Regulation 17 and Schedule 4 (*Information for Inclusion in Environmental Statements*) to the EIA Regulations sets out the information that should be included in an ES. The table below details the requirements and where they are provided within the ES.

Table 1.1 EIA Schedule 4 Requirements

EIA Regulations Schedule 4 Requirement	ES Location Reference
1. A description of the development, including in particular: a) a description of the location of the development; b) a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	a) Chapter 2 Site Description
	b) Chapter 4 Scheme Description, Alternatives and Design Evolution
	c) Chapter 4 Scheme Description, Alternatives and Design Evolution
	d) Chapters 6-14
2. 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.	Chapter 4 Scheme Description, Alternatives and Design Evolution
3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Chapter 2 Site Description Technical chapters where relevant

EIA Regulations Schedule 4 Requirement	ES Location Reference
4. A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Chapters 6-14
5. A description of the likely significant effects of the development on the environment resulting from, inter alia: a) the construction and existence of the development, including, where relevant, demolition works; b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); 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; f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; g) the technologies and the substances used. 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,	a) Chapters 6-14.
	b) Chapters 9 (Ecology) and 11 (Geology, Hydrology and Hydrogeology and Peat).
	c) Chapters 6 (Aviation and Telecommunications, Shadow Flicker and Safety), 7 (Landscape and Visual), 8 (Noise and Vibration) and 11 (Geology, Hydrology and Hydrogeology and Peat).
	d) Chapters 6-14 where relevant.
	e) Chapter 15 (Summary of mitigation, residual and interaction effects).
	f) Chapter's 6-14 where relevant.

EIA Regulations Schedule 4 Requirement	ES Location Reference
positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(1) and Directive 2009/147/EC(2).	g) Chapter 4 Scheme Description, Alternatives and Design Evolution.
6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Chapters 6-14
7. 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 (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	Chapters 6-14
8. A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(3) of the European Parliament and of the Council or Council Directive 2009/71/Euratom(4) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	Table 3.1; Section 6.4
9. A non-technical summary of the information provided under paragraphs 1 to 8.	Non-technical summary provided separately.
10. A reference list detailing the sources used for the descriptions and assessments included in the environmental statement.	Chapters 6-14 where relevant.

1.6 Availability of environmental information

- 1.6.1 The Environmental Statement and other application documents can be viewed on PEDW's planning applications website:

<https://planningcasework.service.gov.wales/>

- 1.6.2 A copy of the ES on USB Flash Drive can be obtained for a charge of £25 from:
PlanningConsultation@savills.com, Telephone 02920 368 900. A printed copy of the NTS can also be obtained free of charge from Savills.

1.7 Consultation

- 1.7.1 Should interested parties wish to make representations, they should be made in writing to:

- 1.7.2 Planning and Environment Decisions Wales
Crown Buildings
Cathays Park
Cardiff
CF10 3NQ

- 1.7.3 Alternatively, representations can be made online by following the link provided in paragraph 1.6.1 and following the instructions provided there for commenting on an application.

2 Site Description

2.1 Site Description

- 2.1.1 The Site is located 6 km to the east of Neath and 4 km to the south of Resolven. It comprises 290 ha of land located on plateaus to the north-east of the village of Tonmawr (Figure 1.1 Site Location Plan). The Site is comprised of two main areas as shown on Figure 1.1, known as Mynydd Blaenafon ('MB') to the west and Mynydd Fforch-dwm ('MFD') to the east.
- 2.1.2 The MB land consists predominantly of pasture land with an area of scrub/bracken on the western slopes that is either recently planted or in preparation for tree planting. Mid-way in the area, Mynydd Blaenafon River runs from east to west. Tonmawr Farm house and associated farm buildings are positioned in the south east (excluded from the application area). A footpath leading from Fforch-dwm Road passes these buildings and leads north over the hill and back down to the northern part of Tonmawr (Figure 2.1).
- 2.1.3 The MFD land is a mix of pasture land with uncultivated land on the slopes and to the east. The farm complex of Fforch-dwm is within the southern part of the MFD section, comprising of two residential properties and agricultural barns accessed off the Fforch-dwm Road. Leading away from these properties, a footpath/track leads up to the site of the proposed turbines. The part of the Site north-east of T3 and T4 and Nant-y-Cywion is Open Access land (Countryside and Rights Of Way Act).
- 2.1.4 Elevations range between approximately 200 metres (m) above Ordnance Datum (aOD) along the west and north of the Site to 350 m aOD in the south east of the Site. Within the MFD Site a small ridge extends south west to north east (Mynydd Fforch-dwm), which lies between the watercourses of Nant Blaenpelenna to the north and Cwm y Pant towards the south of the Site.
- 2.1.5 In terms of adjoining land uses, the south western end of the operational Pen y Cymoedd wind farm (76 turbines with a 145 metre tip height) is immediately adjacent to the north and north east, with the operational Ffynnon Oer wind farm (16 turbines with a 92 metre tip height) to the east. Both of these wind farms are located within upland commercial forestry plantation. Other notable nearby uses include the Afan Forest Park which is approximately 3 km to the south.
- 2.1.6 The Proposed Development will be accessed directly from Fforch-dwm Road, with a new track providing access to the western development area on Mynydd Blaenafon. The eastern part of the Site, MFD, will be accessed from the end of Fforch-dwm Road (See Figure 4.1). Fforch-dwm Road crosses Nant Blaenpelenna. These two points of access would be used for all deliveries to the Site.

2.2 Local Context

- 2.2.1 The Site occupies open ground and forestry between the valleys of Vale of Neath to the northwest and Afon Afan to the south, adjacent to the south west of the operational Pen y Cymoedd wind farm, and with the site access route approaching the Site via Neath, Efail-fâch and Tonmawr.

- 2.2.2 The prevailing wider landscape pattern is of open and/or forested bands of upland set between valleys which contain transport corridors and villages set within a small-scale farmland field pattern with hedgerows, deciduous woodland and trees (Figure 4.2).
- 2.2.3 There are no statutory designated sites for nature conservation located within 5 km of the Proposed Development. There are also no Special Areas of Conservation (SAC's) for bat interests located within 10 km of the Proposed Development (Figure 2.2).
- 2.2.4 The Site includes sections of two non-statutory designated sites: Tyle'r Waum Site of Interest for Nature Conservation (SINC), and Cwm Blaenpelenna SINC is adjacent to part of the MFD Site boundary (Figure 9.1). Tonmawr Mine Water Treatment pond & surrounding habitats site is located alongside Fforch-dwm Road (Appendix 9.1, Annex 4).
- 2.2.5 The Bannau Brycheiniog National Park (BBNP) and Gower Peninsula Area of Outstanding Natural Beauty (AONB) are both more than 14 km from Site. There are a number of registered Parks and Gardens within 15 km. Those which are closest (The Gnoll, Jersey Park and Rheola) would have very limited visibility (Figure 2.2).
- 2.2.6 There are a number of heritage designations within 5 km of the Site, with the Cwm Pelenna Colliery Ventilation Furnace Scheduled Monument and Grade II listed Cwm Pelenna Colliery Ventilation Stack within the site boundary (Figure 12.3). Within 5 km there is one Registered Historic Landscape, two Conservation Areas, two Registered Historic Park and Gardens, 28 Scheduled Monuments, and 143 Listed Buildings.
- 2.2.7 Access for Abnormal Indivisible Loads (AIL) is proposed from Swansea Docks on a route via the A483, M4, A465, A474, B4434, B4287, Ton Mawr Road and Fforch-dwm Road. The use of specialist blade lifting trailers will be necessary to negotiate the constraints located within Neath, Cimla, Efail-fach and Tonmawr.

2.3 Sensitive Receptors

- 2.3.1 Aspects of the Site and adjacent areas to be considered in the design and assessment of the proposals can be identified as:
- Local residents;
 - Local road users;
 - Public Rights of Way users;
 - Landscape receptors;
 - Heritage assets;
 - Water, soil and peat resources;
 - Habitats;
 - Bats and birds;
 - Aviation.

3 Scoping, Consultation and Approach to Assessment

3.1 Introduction

- 3.1.1 This chapter explains how the scope of the EIA has been determined and then sets out the over-arching approach to the assessments that have been undertaken as part of the EIA. Further details of the topic-specific methodologies are explained in the assessment chapters of the ES.

3.2 Scope of the EIA

- 3.2.1 A request for a scoping direction pursuant to Regulation 33 of the EIA Regulations was submitted to Planning & Environment Decisions Wales (PEDW) (Appendix 3.1) in February 2022, which set out the proposed scope of the ES. The Scoping Direction (Appendix 3.2) was issued by PEDW, on behalf of Welsh Ministers in June 2022, which set out the topics listed below to be included in the ES:

- Landscape, Visual Impact and Biodiversity;
- Noise and Vibration;
- Ecology;
- Ornithology;
- Geology, Hydrology and Hydrogeology;
- Archaeology and Cultural Heritage;
- Traffic & Transport;
- Socio-economic Effects;
- Aviation;
- Telecommunications;
- Shadow Flicker;
- Climate Change;
- Major Accidents & Disasters (no standalone chapter);
- Human Health (no standalone chapter).

Table 3.1 PEDW Scoping Direction

Topic	Summary of comments	Refer to ES section
Landscape and Visual	- GN046 should be applied even if the Site is located within a pre-assessed area. The Study area should also be expanded to 26-28 km. - Significant effects within 5-6 km should be demonstrated in assessment. - NPTCBC and NRW request more viewpoints. - Photomontages should include solar arrays. - Cumulative assessment should include other development as well as wind farms, and PEDW disagrees to scope out turbines below 50 m and groups of 3 or less.	Chapter 7 Table 7.1
Noise and Vibration	- Proposed Development does not share the same sensitive receptors as Pen y Cymoedd. - The assessment should reflect the potential for significant impacts to arise from winning material from borrow pits. - PEDW disagrees that vibration from construction traffic can be scoped out.	8.3.10-8.3.14. No borrow pits to be used Noted and scoped in.
Ecology	- PEDW cannot agree on scope of assessment without further information on surveys. - Additional reptile surveys are required. - Bat surveying techniques not clear so PEDW are unable to agree with low/medium site risk for bats. - Amphibians cannot be scoped out. - PEDW disagrees with the scope of assessment as solar element has not been considered on invertebrates. - To note importance of peat for ecology as well as hydrogeology/geology. - No details on collision risk modelling, advise to engage through SOCG. - Paragraph 8.48 is unclear on sensitive receptors. - ES should include a detailed ecological management plan.	Chapter 9 Table 9.4
Ornithology	- ES should justify why survey data for only 2021-2022 has been used for part of the site. - No details on collision risk modelling, advise to engage through SOCG. - Expected that proposals bring a net benefit to the environment.	Chapter 10 Table 10.4
Geology, Hydrology and Hydrogeology and Peat	- ES should include a coal mining risk assessment, including risk of subsidence. - Impact on underlain aquifers should be assessed. - ES should demonstrate that the Proposed Development infrastructure and construction areas are not located in areas where peat is deeper than 0.5 m. - ES should indicate hydrological flows through peat and whether groundwater dependant terrestrial ecosystems are present. - Water quality monitoring is not scoped out.	Appendix 11.3 11.6.7 & Fig. 11.6 11.6.29 & Fig. 4.4 11.4.21-11.4.27 11.7.2-11.7.3
Archaeology and Cultural Heritage	PEDW has no comments.	Chapter 12
Transport and Access	PEDW is supportive of the approach.	Chapter 13

Topic	Summary of comments	Refer to ES section
Socio-Economic Effects	PEDW is supportive of the approach.	Chapter 14
Aviation and Telecommunications, Shadow Flicker and Safety	- PEDW disagree that there is no possibility of NAT's radar being affected. - Telecommunications cannot be scoped out. - PEDW is supportive of the approach on shadow flicker. - ES should address risks of former mine workings on major accidents and disasters. This can be addressed as standalone or within other chapters.	Chapter 6 Table 6.1 Section 6.3 Noted. Section 6.4
	Climate change should be addressed in relevant chapters of the ES.	Sections 7.10, 8.9, 9.9, 10.9, 11.9, 12.9, 13.10 and 14.8.
	PEDW agrees human health can be addressed in other relevant ES chapters.	Section 8.6

- 3.2.2 Waste arising during the construction phase will be controlled by a Construction Environment Management Plan (CEMP), and is considered unlikely to cause significant adverse effects. Due to the nature of the Proposed Development, there will be negligible waste produced during the operation of the development. At end of the development consent a decommissioning and site restoration statement will be prepared and agreed with NPTCBC.

3.3 Consultation

Public Consultation

- 3.3.1 There has been one round of informal consultation which consisted of three events across two days. The events were advertised in the South Wales Evening Post across three days, as well as being shared by ward councillors on several local social media groups. Community newsletters that provided basic information on the proposal and invited residents to the events were sent to the 2,675 residential and business addresses in the consultation zone. Advertising was also carried out via Facebook, which was shown on-screen to a total of 21,921 unique users.
- 3.3.2 A Virtual Village Hall was held on Wednesday 13th July 2022 from 19:00-20:00 to present the Proposed Development and allow dialogue and questions between the public and the project team. The event was attended by two members of the public.
- 3.3.3 The first public exhibition was undertaken on Thursday 14th July 2022 10:00-14:00 at Neath Little Theatre to provide the public with details of the project and answer any questions that might arise. This was attended by 12 members of the public.
- 3.3.4 The second public exhibition was held at Tonmawr Rugby Football Club on Thursday 14th July 2022 16:00-20:00 and was attended by 36 members of the public.

Technical Consultation

- 3.3.5 The consultation undertaken in relation to refining the approach to assessment can be found within the technical chapters, where consultation relevant to each discipline is described in full. A summary of consultation undertaken for the EIA in addition to the formal scoping

request process is described below.

- 3.3.6 Aviation consultation responses were received from stakeholders as a result of EIA scoping. Cardiff Airport raised a concern relating to radar interference. As a result of discussions with both NATS (the Air Navigation Service Provider (ANSP)) and the airport management, it was agreed, that in common with several other wind farm developments in South Wales, it would be technically feasible to mitigate the effects of the turbines in order to enable Cardiff to continue to provide radar-based ATC services in the vicinity of the wind farm after the turbines begin operating. The MOD advised that aviation lighting to be included, which has been specified in the design.
- 3.3.7 Telecommunications consultation with telephone, internet and radio providers was undertaken, with no objections raised. Arqiva objected to the position of T1, and after further analysis, confirmed that a suitable form of mitigation is available and can be implemented under the terms of an agreement with the developer.
- 3.3.8 Consultation for landscape and visual effects involved NPTCBC and NRW being consulted in relation to: the scope of the assessment; the selection of viewpoints, and the extent of the LVIA study area, during both the pre-application and EIA scoping stages. NPTCBC and the local community were also consulted in relation to the size of the proposed wind turbines and their comments have been taken into account in relation to the scale and appearance of the turbines in views from Tonmawr.
- 3.3.9 Noise consultation centred around PEDW's initial disagreement with the approach to reuse the Pen-y-Cymoedd survey data, in part due to the date of the survey, and because it was thought that schemes may not share the same sensitive receptors. However, further explanation in response to PEDW's concerns set out the reasons why it is considered suitable, which are detailed in Chapter 8. This was resolved in a detailed discussion with an independent noise consultant appointed by NPTCBC, who agreed with the approach to the use of baseline data.
- 3.3.10 Discussions have been held with NPTCBC Countryside and Wildlife team regarding the layout of the Proposed Development and potential effects on peat. These discussions further informed the design process, which initially set out to minimise the development footprint on deeper areas of peat or peaty soils through the constraints analysis process (Figures 4.4, 2.1).
- 3.3.11 A coal mining risk assessment has been provided as Appendix 11.3, which was requested within the scoping direction (Appendix 3.2).
- 3.3.12 The Written Scheme of Investigation (WSI) was submitted to the Planning Officer at Glamorgan-Gwent Archaeological Trust (GGAT) for review, comment, and approval as part of the assessment undertaken.
- 3.3.13 In relation to transport related issues, consultation with NPTCBC was undertaken via the scoping direction to agree the likely scope of the TA. Consultation has centred around data collection count sites, likely points of origin for materials to assist in developing a suitable study network, and the discussion of the extent of information necessary to understand the effects of the transport of abnormal sized loads to the site.

Statutory consultation

- 3.3.14 An extended period of statutory pre-application consultation was undertaken for 49 days between 5th December 2022 and 23rd January 2023. The period of statutory consultation was extended to take account of the Christmas holiday period (which the applicant discussed with PEDW) and comments raised during the informal consultation beforehand (when additional time was requested to meet during this period).

Further public consultation

- 3.3.15 Following the commencement of statutory public consultation on 5th December, the applicant organised an online webinar (or Virtual Village Hall) event for interested parties to attend. The event comprised of a project overview by the applicant before then taking questions.
- 3.3.16 Following the Virtual Village Hall, the applicant then organised an open door public consultation on 15th December 2022 across two sessions: 1) in Neath and 2) in Tonmawr Rugby Club. These locations were chosen in consultation with the local Ward Councillor.
- 3.3.17 A further event was held on 18th January 2023. This event responded to the feedback from the event on 15th December 2022, with a number of specialists present to field questions from interested parties. Then, on the 19th January 2023, the applicant attended a meeting with Pelenna Community Council.

Project website

- 3.3.18 A project website was created to provide information about the scheme to the public. This is available to view at <https://mfdwindfarm.co.uk/> with information about the proposed development, which has been updated as the project has progressed. The website also includes details about how to contact the project team with any queries or feedback.

3.4 Assessment methodology

- 3.4.1 Defining a consistent baseline is an important part of the EIA process. Baseline conditions are defined as the existing state of the environment and how it might develop in the future in the absence of the proposals. This is established through desk-based analysis and surveys of the area. It is against the defined baseline that the significance of environmental effects are assessed.
- 3.4.2 The topic specific assessments contained within this ES assess the likely significant effects of the Proposed Development at both the construction and operational phases. The EIA has considered the effects relating to decommissioning to be similar to the construction process, but with less activities and taking place over a shorter duration.

Study areas

- 3.4.3 Given the scale of the Proposed Development and the diverse nature of the environmental effects being assessed, it is not possible to define a single standard study area for all environmental topics considered. Instead, appropriate study areas have been defined and justified in the respective topic-based chapters of this ES, where relevant, based on recognised topic-specific guidance.

Receptor Sensitivity

- 3.4.4 The sensitivity of a receptor refers to its importance, i.e., its environmental value and attributes, which may include a level of statutory designation. The terminology defining

sensitivity can vary according to the discipline or the methodology being used. However, in this, ES sensitivity is generally defined as Very High, High, Medium, Low or Negligible. An example of the definition of the sensitivity of receptors is set out in the table below. Following chapters of this ES consider the attributes of specific receptors in more detail.

Table 3.2 Receptor sensitivity

Sensitivity	Example
Very High	International designated site (e.g. Ramsar / SAC / World Heritage Site).
High	National designated site (e.g. SSSI) / designated Landscape (e.g. National Park) / designated heritage asset / principal aquifer / main watercourse / human health.
Medium	Regional designated ecology / heritage site / secondary aquifer / minor watercourse.
Low (or lower)	Local designated ecology / heritage site; area of hardstanding / brownfield land / industrial site / site of low ecological value.
Negligible	No sensitivity to change.

Determining impact magnitude

- 3.4.5 Magnitude is determined by predicting the scale of any potential change in the baseline conditions. Where possible magnitude is quantified, but where this is not possible a fully defined qualitative assessment has been undertaken and a magnitude assigned as a result of this. The assessment of magnitude takes into account any design or embedded mitigation in a proposed development, and any additional mitigation has been applied.

Table 3.3 Magnitude of impact

Magnitude		Example
Major	Adverse	A permanent or long-term adverse impact on the integrity and value of an environmental attribute or receptor.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Adverse	An adverse impact on the integrity and/or value of an environmental attribute or receptor, but recovery is possible in the medium term and no permanent impacts are predicted.
	Beneficial	Benefit to, or addition of, key characteristics, features, or elements or improvement of attribute quality.
Minor	Adverse	An adverse impact on the value of an environmental attribute or receptor, but recovery is expected in the short- term and there would be no impact on its integrity.
	Beneficial	Minor benefit to, or addition of key characteristics, features or elements; some beneficial impact on attribute or a reduction in the risk of a negative impact occurring.
Negligible	Adverse	Very minor loss.
	Beneficial	Very minor benefit.
No change		No change would be perceptible either positive or negative.

Determining the level of effects and significance

- 3.4.6 To determine the level of effect, the predicted magnitude of the impact is combined with the assigned sensitivity of the receptor, as set out in the table overleaf.

- 3.4.7 The interaction of magnitude and sensitivity combined enables the determination of an environmental effect on a scale. Deviation from the terminology may occur in cases where an established methodology requires this, and where relevant this is explained in the chapters that follow.
- 3.4.8 According to Schedule 4, paragraph 5 of the EIA Regulations 2017, The description of the likely significant effects 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’. The definition of what level of effect becomes significant in the assessment is provided in the method section of each of the topic-based chapters that follow. Typically those effects deemed to be at a level of moderate or greater, are deemed to be significant for the purposes of this assessment.

Table 3.4 Level of effect

		Magnitude of impact				
		No change	Negligible	Minor	Moderate	Major
Receptor Sensitivity	Very high	Neutral	Slight	Moderate	Large	Very large
	High	Neutral	Slight	Moderate	Large	Large
	Medium	Neutral	Slight	Slight	Moderate	Large
	Low	Neutral	Slight	Slight	Slight	Moderate
	Negligible	Neutral	Neutral	Neutral	Neutral	Neutral

Mitigation

- 3.4.9 Schedule 4, paragraph 7 of the EIA Regulations 2017 requires: ‘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 . . .’ When describing mitigation measures, they generally fall under two headings, ‘design or embedded mitigation’ and ‘additional mitigation’.
- 3.4.10 Design or embedded mitigation is where the design of the Proposed Development has been altered to take account of a particular environmental consideration or accommodate an important feature. The mitigation taken into account in this EIA is identified in Chapter 4 and in the topic-based chapters of this ES. The arrangement of the Proposed Development has involved the consideration of potential impacts of alternative designs and layouts.
- 3.4.11 Additional mitigation is all other mitigation that has been identified as a result of the EIA undertaken for the design of the Proposed Development. Additional mitigation is described and assessed in the chapters that follow and is summarised in Chapter 15: Summary of mitigation, residual and interaction effects.
- 3.4.12 Effects that remain after consideration of the proposed mitigation measures are termed ‘residual effects’. The key outcome of the EIA is whether these residual effects are likely significant effects and these are clearly defined within the technical chapters and set out in Chapter 15 of this ES.

3.5 Climate change

- 3.5.1 Utilising the UK Climate Change projections UKP18, each assessment chapter includes a section that qualitatively assess how potential Climate Change may alter the effects predicted for each receptor. This exercise accords with the IEMA Guidance by use of the highest

emissions scenario for the future scenario 'with Climate Change'. That is: RCP8.5, 50th percentile, as shown by the table in Appendix 3.3.

3.6 In-combination and cumulative effects

- 3.6.1 Schedule 4, Paragraph 5(e) of the EIA Regulations 2017 requires the EIA to take into account the '*cumulation of effects with other existing and / or approved projects taking into account any existing environmental problem relating to areas of particular environmental importance likely to be affected or the use of natural resources*'.
- 3.6.2 Schedule 4, Paragraph 5 of the Regulations requires also that:
- 'The description of the likely significant effects on the factors specified in regulation 5(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.'*
- 3.6.3 This ES also considers the inter-relationships between different effects related to developing the proposal (sometimes described as in-combination or synergistic effects). This is where receptors may experience more than one non-significant effect, which collectively, may act together to become significant. The potential for these to arise is considered in Chapter 15.
- 3.6.4 For the assessment of cumulative effects, a process was used to identify other development for consideration as to which might be relevant. A search of planning permissions and planning applications returned results that were filtered, based on location, scale and development type, to retain development considered to be relevant. This process resulted in a long list of potential cumulative developments identified in a table, which the project team utilised as part of their assessments (Appendix 3.4). The table includes wind turbines and Developments of National Significance within 30 km of the Site, with other development, such as commercial/industrial uses, included within a 10 km radius. The location of these can be seen in Figure 3.1.

4 Scheme Description, Alternatives and Design Evolution

4.1 Introduction

- 4.1.1 This chapter provides the description of the Proposed Development for the purposes of the EIA.
- 4.1.2 The chapter identifies the construction and operational design features of the Proposed Development that might affect the environment or contribute to the overall environmental effects of the scheme.

4.2 Development Description

- 4.2.1 The site layout is shown on Figure 4.1. The plan sets out the proposed layout for the development of the Site within the redline boundary, which covers an area of 290 ha in total.
- 4.2.2 The EIA has assessed the development and operation of:
- Six horizontal axis three blade wind turbines with a maximum height to blade tip as follows
 - T1, T2 - 180 m;
 - T3, T4, T5, T6 - 200 m;
 - wind turbine foundations; crane pads/turbine laydown areas;
 - Switching Station /Control Building, and communications mast;
 - temporary and permanent access tracks and turning places;
 - a replacement bridge over Nant Blaen Pelenna, part temporary and part permanent;
 - ~10 ha of solar PV panels, mounted on frames fixed to the ground, with associated inverters, solar transformer stations and a storage container, security fencing and CCTV system;
 - underground communication & electricity cables between the wind turbines, solar array and the Switching Station / Control Building (two possible locations considered); and
 - two temporary construction and storage compounds.
- 4.2.3 The ES Figures used in the assessment are:
- ES Figure 4.1 Proposed Scheme Layout
 - ES Figure 4.2 Proposed Scheme - Aerial Overview
 - ES Figure 4.3 Proposed Scheme - slope
 - ES Figure 4.4 Proposed Scheme - peat depth
 - ES Figure 4.5 Indicative turbine
 - ES Figure 4.6 Wind turbine foundation
 - ES Figure 4.7a Switching Station Plan
 - ES Figure 4.7b Switching Station Elevations
 - ES Figure 4.8 Solar Array Cross Section
 - ES Figure 4.9 Cable trench
 - ES Figure 4.10 Floating Road

- ES Figure 4.11 Access track
- ES Figure 4.12 Access point Fforch-dwm Road
- ES Figure 4.13 Replacement Bridge plan details
- ES Figure 4.14 Construction compound
- ES Figure 4.15 Indictive grid connection corridor
- ES Figure 4.16 Communications mast
- ES Figure 4.17 Solar PV Layout

4.2.4 Plans (Figures 4.1-4.17) show the site layout that has been refined in an iterative process and in consultation with PEDW and NPTCBC.

Turbines and Turbine Foundations

4.2.5 The Proposed Development will comprise six wind turbines (Figure 4.1). The locations of the wind turbines are defined below in Table 4.1, which shows easting and northing grid coordinates for each wind turbine.

4.2.6 As shown in Table 4.1, the wind turbines will range in maximum tip height from 180 m up to 200 m. Each wind turbine will be comprised of three blades, the hub, the nacelle, and the tower.

4.2.7 The layout of the wind turbines can be seen in Figure 4.1. Two wind turbines (T1 and T2) are proposed in the western part of the Site on Mynydd Blaenafon (MB), and four wind turbines (T3, T4, T5, T6) are proposed in the eastern part of the Site on Mynydd Fforch-dwm (MFD).

Table 4.1 Turbine Details

Turbine ID	Easting	Northing	Maximum Tip Height (m)
1	281131	197711	180
2	280629	197599	180
3	283088	197744	200
4	282628	198074	200
5	282522	197493	200
6	282036	197830	200

4.2.8 The wind turbines will be finished with white or light grey colour paint, without external markings or advertisements. The brand and model of wind turbine to be used is subject to confirmation, so the EIA has considered the maximum tip height specified above in Table 4.1.

4.2.9 It is proposed that wind turbines T2, T3, T4 will be lit with 2000 candela (cd) lights for aircraft navigation purposes. Wind turbines T1, T5 and T6 can be identified using a lower intensity of lighting and are proposed to be lit with 200 candela lights. The wind turbine hubs will also include the provision of infrared lighting for flight safety as specified by the Ministry of Defence.

4.2.10 The detail of foundation requirements is subject to finalisation and is dependent on detailed ground investigation and site specific requirements. Foundations are typically comprised of a reinforced concrete base slab, as illustrated by Figure 4.6. The design of the foundations will seek to minimise the amount of material excavated and any projection above the existing

ground level. This is to allow for the re-establishment of surface vegetation after construction is completed. During excavation and construction, particular care will be taken to minimise the effects on the prevailing surface and sub-surface hydrology, with a focus on maintaining conditions suitable for any peat resource in the area of construction.

Hardstandings

- 4.2.11 A crushed-stone hardstanding area will be located next to the site of each wind turbine in order for cranes and construction vehicles to operate during construction, and for necessary access for maintenance vehicles during operation of the wind turbines. The hardstandings will remain through the Proposed Development's lifetime until they are removed and reinstated upon decommissioning.
- 4.2.12 Temporary crushed-stone hardstandings will also be required during the construction phase to accommodate blade lifting vehicles etc. The material to be used for this will be brought to the Site, and will be removed with the ground surface reinstated upon completion of turbine construction.

Switching Station /Control Building

- 4.2.13 The electrical power will be distributed from the wind turbines & solar array to a Switching Station /Control Building. Figure 4.7a and Figure 4.7b show a typical building used and its dimensions. This will be subject to further specification during the detailed design phase and DNO approval process. Two options for locating the building are shown on the site layout (Figure 4.1), and both locations have been assessed in the EIA. However, only one building will be constructed, the location of which will be determined by the details of the grid connection.

Solar Array

- 4.2.14 The layout of the solar array is configured in relation to the topography of Mynydd Blaenavon and the existing field boundaries. As shown on Figure 4.1, the extent of the solar array is mostly located to the north of the access track onto the plateau of Mynydd Blaenavon, with panels either side of a field boundary marked by a dry stone wall. A relatively small part of the solar array is located on the south-eastern side of the access track.
- 4.2.15 The solar array will include electrical inverters housed within small cabinets, installed adjacent to the panels. The inverters convert the electrical current produced by the solar panels, and will be cable connected to a transformer located within a solar transformer station. These transformers raise the voltage of the electrical output so that it can be efficiently transmitted to the grid. The solar array will require up to four solar transformer stations (typical size c. 6.1 m x 2.5 m x 2.6 m high).
- 4.2.16 The solar panels will be mounted to a fixed structure, with a minimum ground clearance of 0.9 m. The panels will be mounted to the structure at a 25 degree tilt angle, with approximately 28 panels to be fitted to each structure. A distance of 0.5 m is proposed between consecutive rows, with a pitch distance between rows of 8.85 m.
- 4.2.17 A chain link perimeter fence is proposed to enclose the solar array, which will run for approximately 1.7 km and will be up to 3.0 m in height. For every 50 m of fence, a security light post of 4.0 m in height and a microwave barrier system would be installed. For every 100 m of fence, a CCTV camera post of 6.0 m in height would be installed.

- 4.2.18 Maintenance roads are proposed to be 4.0 m wide and run for approximately 1,105 m in length. Ditches will be used for drainage and channelling water along one side of the roads.
- 4.2.19 The proposed layout of the solar array, the location of solar transformer stations and other infrastructure can be viewed in Figure 4.17.

Site Access Tracks and the continuity of lateral drainage

- 4.2.20 The Proposed Development will be accessed directly from Fforch-dwm Road, with a new point of access to the highway, and a new track providing access to the western development area on Mynydd Blaenafon. The eastern section of the Site will be accessed from the end of Fforch-dwm Road. These two access routes would be used for all construction and maintenance associated with the Proposed Development.
- 4.2.21 It is anticipated that 5.5 km of new track will be required for the Proposed Development, and some 2.9 km of existing track/road upgraded. The tracks will be circa 5.0 m wide, plus shoulders of c.1 m on either side, and with a verge up to 2-3 m to accommodate cabling along the track alignment (Figure 4.11). The average working corridor for the construction of access tracks (and where relevant cable trenches) would be 14 m.
- 4.2.22 The tracks would be 0.3 m – 0.6 m deep (depending on ground conditions), constructed of suitable stone, unless ground conditions require alternative methods, such as shown on Figure 4.11 for tracks on sections of land where the continuity of lateral drainage is to be maintained. Where existing tracks are utilised, these will be upgraded as required. Gradients for new tracks will be no more than 12.5 percent. This will help to accommodate the requirements of delivery vehicles and allow construction plan to move safely around the Site.
- 4.2.23 During operation, the access tracks will be maintained and monitored with regular maintenance to be undertaken on the track drainage systems to ensure they remain fully operational. This is important to maintain the hydrological regime across the Site in areas where the habitats are dependent on specific conditions.

Management of soils and peat resource

- 4.2.24 Mitigation is proposed to avoid and manage the potential impacts on peat that can occur during construction. These are:
- Loss of structural integrity and peat strength;
 - Exposure, erosion and desiccation of bare peat surfaces;
 - Contamination, or inappropriate laydown of materials; and
 - Peat slide, caused by inappropriate stockpiling, or without appropriate support.
- 4.2.25 A Soils and Peat Management Plan (SPMP) has been prepared to prevent or minimise these impacts from occurring (See ES Appendix 11.2). The following paragraphs outline the detailed mitigation presented in the SPMP to minimise impact, based on the re-use of peat in the proposal.
- 4.2.26 The wind turbine foundations represent a permanent excavation and the primary mitigation measure has been to avoid the areas of deepest peat. The SPMP details peat depths in relation to proposed infrastructure. Peat is present at the location of Turbine T1 and Turbine T3 only, their positioning and the crane hardstanding has been guided by the results of the peat probing surveys. In relation to crane hardstandings, the guidance is to avoid their full

reinstatement post-construction, given the need for maintenance activities associated with the wind turbines. Peat probing results show no peat at the temporary construction compounds.

4.2.27 Good practice set out in the SPMP includes:

- Peat would not be stored higher than 1m and could be seeded to prevent drying out, if stored for longer residence times;
- Stripped turves are used for final restoration;
- Temporary fencing may be considered around restoration to prevent grazing; and
- The choice of seed mix for reseeded should be appropriate to the ecological and hydrological conditions of the location and surrounding habitats.

4.2.28 For all types of track the following measures should be implemented:

- Prior to construction works, identify any ground instability concerns or particularly wet zones;
- Identifying 'stop' rules, i.e. weather dependent criteria for cessation of track construction;
- Maximising the interval between track construction and material deliveries.

4.2.29 Good practice guidance relating to drainage in association with excavated tracks prescribes:

- Trackside ditches should capture surface water within the acrotelm;
- Interceptor drains should be designed to limit drawdown of the water table;
- Any stripped peat turves should be placed back in the invert and sides of the ditch to assist regeneration and prevent erosion to the peat and wash out that could occur;
- Drains should be installed under excavated tracks to maintain subsurface drainage pathways;
- Discharge from constructed drainage should minimise the disturbance to existing peatland as far as possible;
- Silt mitigation measures will be incorporated into all constructed drainage.

4.2.30 Regular routine monitoring should be scheduled post-construction to ensure that hydrological pathways and track integrity have been suitably maintained.

4.2.31 Where soil or peat are used at trackside shoulders, excavated soil will generally be reused for the reinstatement and landscaping of constructed access tracks. Some limited re-use of peat for trackside reinstatement can be considered using good practice under the following conditions:

- If it reduces or buffers runoff, encourages habitat restoration, stabilises verges, minimises visual impact;
- re-used peat consists of turves and drier acrotelm peat only;
- widths of reinstated verges are kept to a minimum, defined and justified on a case by case basis;
- Use low verges on the sides of the track to permit any surface water to drain naturally, and diffusely, where it arises;
- Reinstatement is only applied in stretches of low longitudinal track gradient (e.g. $<5^\circ$) to ensure stability, with batters used to form stable slopes;

- Rapid revegetation of the soil and peat surface through the use of stored turves or re-seeding is encouraged to stabilise the reinstated area and minimise erosion;
- Buffer zones are maintained around surface water bodies where no peat restoration is carried out; and
- Verges may also be suitable locations for burying cables to avoid excavating cable trenches in undisturbed peat material. If this is planned, then the verges should be constructed wider to accommodate the cabling.

4.2.32 Careful assessment and selection of peat by the ECoW to be used for reinstatement, in line with the guidelines set out above, will ensure that peat integrity is retained and there will be no loss of peat through this process.

4.2.33 In respect of cable trenches, good practice guidance for soil/peat excavation is as follows:

- Utilise trackside shoulders for cable lays where possible to minimise peat excavations specifically for this purpose, in this case, peat shoulders should be 1.0m to 1.5m thick;
- Minimise time between excavation of the cable trench and peat reinstatement, preferably avoiding excavation until the contractor has cables on-site ready for installation; and
- Avoid incorporating substrate materials in the excavation, to minimise contamination of the peat to be reinstated. Replace excavated materials sequentially.

Cable laying

4.2.34 Underground electrical cables would run from each wind turbine location to the onsite Switching Station / Control Building. The cables would typically be buried underground alongside the access tracks (Figure 4.9). Cable trenches would either be excavated into existing ground, made ground or areas consisting of shallow soils or peat. Irrespective, cable trenches would require backfilling with original material from the point of origin. Further detail is provided in section 9 of the Outline Construction Environmental Management Plan (Appendix 4.1).

Access for Abnormal Indivisible Loads

4.2.35 Access for Abnormal Indivisible Loads (AIL) will be taken from Swansea Docks to the Site. The route selected has been considered in detail and initial consultations undertaken with local roads officers. The proposed route is shown on Figure 13.4, via the A483, M4, A465, A474, B4434, B4287, Ton Mawr Road and Fforch-dwm Road. The use of specialist blade lifting trailers will be necessary to negotiate the constraints located within Neath, Cimla, Efail fach and Tonmawr.

Watercourse Crossings

4.2.36 It is proposed to replace the existing bridge of Fforch-dwm Road over the Nant Blaenpelenna with a new structure (Figure 4.13). The design is comprised of two sections: the northern span as a permanent replacement; and the span on the southern side used during construction, which will then be removed when construction is complete.

Electrical Connection

4.2.37 The Applicant has secured a grid connection contract with the local DNO, National Grid Electricity Distribution (formerly Western Power Distribution). The required connection works

between the Site and the existing distribution network at the Briton Ferry Substation will be the subject of a separate planning application.

- 4.2.38 Two locations for the provision of a Switching Station / Control Building / Communications Mast are currently shown on the proposed site layout plan (Figure 4.1). However, only one is required, the location of which will depend upon confirmation by National Grid Electricity Distribution of the detail for the grid connection arrangements. This building will house equipment for interfacing with the grid, controlling the wind turbines and solar array and also for communicating with the National Grid Electricity Distribution control room, via a communications mast that will be located close by (Figure 4.7a and Figure 4.7b).

4.3 Construction and implementation

- 4.3.1 This section describes the anticipated programme of construction works and the key activities that will be undertaken prior to completion of the Proposed Development.

- 4.3.2 The proposed construction and completion times for the Proposed Development are as follows:

- Construction 12 month period
- Development operates over a 35 year period
- Decommissioning 6 month period.

Construction Environmental Management Plan (CEMP)

- 4.3.3 Details of measures to protect the environment during the construction of the Proposed Development will be set out in a CEMP. Measures will address hours of working, noise, vibration, dust, light spill, wheel washing and control of runoff. It is anticipated that the implementation of the CEMP will be a condition of the planning permission and that it will be regularly monitored.
- 4.3.4 Once finalised and approved, the CEMP would be held on-site. All site personnel would be made aware of its existence and undertake to adhere to the guidance.

Working hours

- 4.3.5 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 wind turbine erection may take place outside these hours. No work is proposed on Sundays and public holidays unless otherwise agreed with the Council.
- 4.3.6 In order to maintain these working hours, the contractor(s) may require a period of up to half an hour before and after these hours for start-up and close down of activities. This does not include operation of plant or machinery giving rise to noise with the potential to disturb nearby residents.

Construction Traffic

- 4.3.7 Construction traffic movements consider the following sources of traffic:
- Workforce movements to and from the Site;
 - Deliveries made to the Site;
 - Removal/ import of material from the Site; and

- Trips made by associated trades.

4.3.8 The Proposed Development will be accessed directly from Fforch-dwm Road, with a new link providing access to the western development area on Mynydd Blaenafon. The eastern section of the Site will be accessed from the end of Fforch-dwm Road. These two accesses would be used for all deliveries to the Site.

Safe storage of fuel/oil

4.3.9 The safe storage and use of fuels for the plant will be a priority in site management. Drainage within the temporary, secure site compound where construction vehicles will park and where any diesel fuel will be stored, will be directed to an oil interceptor to prevent pollution should any spillage occur. Diesel storage and refuelling will be within a designated area or a self-bunded tank in accordance with the Government's Oil Storage Regulations. All oil storage tanks are proprietary self-bunded to equal quantities of oil held. This is regarded as industry standard practice and also includes mandatory legal requirements which are considered as integral to the development. Spill kits and mandatory spillage reporting is standard procedure.

Health and Safety

- 4.3.10 All work will be undertaken to relevant Health and Safety legislation. The construction of the Proposed Development will be supervised in accordance with the CDM Regulations 2015. Risk assessment will be undertaken for each work package prior to activities taking place.
- 4.3.11 Any opportunities for crime will be minimised through effective design measures, such as fencing around the solar array being incorporated into the Proposed Development. Additionally, the construction compound would be lit and it is anticipated that appropriate control measures would be established and put into place, which will be noted within the CTMP and CEMP.

4.4 Construction Waste

4.4.1 In order to minimise the volume of waste generated, a CEMP has been prepared (ES Appendix 4.1). The CEMP would ensure that significant adverse effects from the management of waste would be unlikely. It is not considered that significant quantities of waste will be produced. Spoil arising from ground works will be stored and will be reused on site. A limited amount of waste construction materials will be recycled as appropriate.

4.5 Decommissioning

- 4.5.1 The Proposed Development would be operational for up to 35 years and will include site management to ensure that the site facilities, such as access tracks, boundaries and gates are maintained. At the end of a planning consent for the wind turbines, there would be a requirement to decommission the wind farm / solar array and remove the wind turbines, Switching Station /Control Building, Communications Mast, Solar Array and Solar Transformer Stations.
- 4.5.2 Decommissioning would take approximately six months. The environmental effects of decommissioning are considered to be no greater than construction effects and experienced over a shorter time period.
- 4.5.3 Either the restored temporary construction compound would be re-established or a new construction compound would be developed as agreed with NPTCBC at the appropriate time,

to temporarily store decommissioned plant and equipment. The nacelles and blades would be removed using cranes situated on the crane pads as previously constructed. The towers would then be dismantled.

- 4.5.4 The solar panels and associated components would be dismantled and removed from the Site.
- 4.5.5 The majority of components of the wind turbines and solar array would be removed from the Site for recycling or disposal as appropriate and in accordance with regulations in place at that time. Depending on their disposal/recycling some access tracks may need to be re-instated for decommissioning.
- 4.5.6 It is likely that exposed parts of the wind turbine concrete foundations would be removed down to below 1 m below the surface and the remaining volume of the foundations would remain in situ. Underground cables will be made safe and left in situ with exposed tails cut off and removed. It is considered that leaving these elements in situ will cause less environmental impact than that of complete removal.
- 4.5.7 Hardstandings will be removed and/or grassed over, however it is likely that sections of access track may be left in situ to assist with agricultural access. The CEMP will be updated prior to decommissioning by the Principal Contractor to reflect legislation and policy in place at the time, and will be agreed by NPTCBC prior to the decommissioning process.

4.6 Alternatives and Design Evolution

Alternative Sites

- 4.6.1 The location of the Site has been identified to accord with the spatial frameworks provided by adopted and emerging national and local planning policy.
- 4.6.2 Future Wales: The National Plan 2040 was published in February 2021 and is the National Development Plan for Wales, setting out the direction for development to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy and achieving decarbonisation and climate-resilience. Future Wales 2040 set out the national development plan context for energy and provides specific policies for heat network and renewable energy development.
 - Future Wales incorporates the following national policy targets on renewable energy:
 - For 70% of electricity consumption to be generated from renewable energy by 2030;
 - For one gigawatt of renewable energy capacity to be locally owned by 2030;
 - For new renewable energy projects to have at least an element of local ownership from 2020.
- 4.6.3 Future Wales states that the planning system plays a significant role in the provision of new renewable and low carbon energy and gives effect to the Welsh Government's national targets, setting the overall strategic framework and direction within which developers can propose new energy infrastructure projects. Future Wales notes that "Wales can become a world leader in renewable energy technologies. Our wind and tidal resources, our potential for solar generation, our support for both large and community scaled projects and our commitment to ensuring the planning system provides a strong lead for renewable energy

development, mean we are well placed to support the renewable sector, attract new investment and reduce carbon emissions”.

- 4.6.4 The pre-assessed areas for wind energy alongside Policies 17 and 18 provide policy direction setting out requirements for DNS scale projects.
- 4.6.5 These pre-assessed areas have been identified by the Welsh Government and are considered, in principle, to be areas where DNS scale onshore wind projects would be acceptable subject to the criteria of Policy 17. Accordingly, Policy 17 sets out that there is a presumption in favour of large-scale onshore wind energy development and the associated landscape change, subject to the criteria in Policy 18.
- 4.6.6 The Site is located within ‘pre-assessed area for wind energy (area 9)’, which means Policy 17 is relevant, and there is emphasis on Policy 18 as it provides the criteria to frame assessment priorities and decision making.
- 4.6.7 The proposed site has therefore been identified in response to the clear national and local planning policy focus to the delivery of onshore wind projects in this area.

Design influences and design iterations

- 4.6.8 The design approach included, and required, consultation with key consultees – both statutory and non-statutory bodies – including Neath Port Talbot Council and other interested stakeholders, including local residents (Community Consultation July 2022).
- 4.6.9 The potential developable area for the proposal was refined in an iterative process, involving the mapping of the Sites characteristics and that of the surrounding area. Constraints included, but are not limited to, protected areas, terrestrial constraints, habitat and species and their buffer zones and areas of existing and proposed forestry (Figure 2.1). These features all informed the design of the proposal and its associated infrastructure.
- 4.6.10 The design of the Proposed Development has been informed by a series of considerations, including environmental, planning, engineering and existing and proposed land uses. The aim of this process has been to identify an appropriate solution that has considered and balanced these constraints alongside the need for sufficient number and scale of development to deliver a significant quantum of renewable energy.
- 4.6.11 In parallel to, and informing the design process, the environmental assessment process has identified opportunities for positive design – whether that be the location and height of the turbines; the routing of access tracks or other benefits.

Design influences

- 4.6.12 A number of factors and constraints that influence the design include, but are not limited to:
- Site topography – the topography of the Site has been surveyed and used to inform the location of the wind turbines and solar array, which are focused upon the plateaus of MB and MFD;
 - Distance between wind turbines – to minimise interference effects, the wind turbines have been separated by distances with reference to the rotor diameter, both perpendicular to and in line with the prevailing wind direction. This design features is key in optimising the energy generation of the Proposed Development;
 - Existing land use – whilst the Proposed Development occupies a relatively small proportion of the Site, the existing use of the land has been considered in the layout of

the Proposed Development. For example, existing tracks will be used and enhanced where possible;

- The presence, size and proximity of woodland is an important feature – in terms of future screening and how it interacts with the Proposed Development.

Design iteration

- 4.6.13 The potential developable area for the proposal was refined using the mapping of the Site's characteristics and that of the surrounding area. Constraints included, but were not limited to, protected areas, terrestrial constraints, habitat and species (including appropriate buffer distances) and areas of existing and proposed forestry. These features all informed the design of the proposal and its associated infrastructure (Figure 2.1).
- 4.6.14 As shown in Figure 2.1, the key characteristics and constraints to the Site and its surroundings included: Bridleways, byways and footpaths (including Public Rights of Way); Peat; Watercourse and waterbodies and associated buffer areas; Buffer areas from the Site boundaries and existing features; Topple and turbulence standoff distances from turbines.
- 4.6.15 Noting both the location of the Site and from initial site walkovers, it was assumed that peat was likely to be present on the Site – albeit the depth of peat resource was unknown at the initial stage (Figure 11.4).
- 4.6.16 A phase 1 peat survey provided an indication of the likely peat resource on the Site, and this was subsequently followed up with a phase 2 peat survey that provided further granularity in respect of the peat resource on the Site (see Figure 11.3 & Appendix 11.2).
- 4.6.17 The phase 2 peat surveys consisted of the additional probing focussed in the areas around where the turbines were likely to be located. This improved the understanding of the likely presence and depth of peat resource, and was used in refining the most appropriate locations for the turbines with a specific response to peat.
- 4.6.18 The location of the turbines was refined after the EIA scoping stage using the further detailed survey information, which led to the design presented in the Pre-application consultation. On the MB area, Turbine 1 was moved 80 m east, Turbine 2 was also moved east, a distance of 36 m. On MFD area, Turbine 3 was moved 36 m east; Turbine 4 moved north-east by 12 m; Turbine 5 moved 27 m south-east; and Turbine 6 moved 27 m in a south-west direction. T1 was moved so that the turbine is not located within a deeper pocket of peat (Figure 4.4). T2 has been re-located to an area of shallower peat (or possibly no peat).
- 4.6.19 Whilst the linear configuration required for the associated tracks, laydown areas and crane pads, reduces the options to refine their alignment, the track to T1 has been realigned to avoid an area of deeper peat associated with a small mire feature (M25b). The realigned section of track crosses peat with a depth of up to 0.5 m for a short section. The track to T2 passes to the south of the area of deeper peat towards the centre of MB plateau. This section of track has been realigned as far as possible to avoid the deeper peat. However, a short section of the track crosses peat up to 0.7 m in depth.
- 4.6.20 In addition to the consideration of the peat depth, the design of the access tracks on MB has also had to take account of the Glastir forestry grant (Figure 2.3 and 4.6.30 below) in identifying route alignment.
- 4.6.21 The possibility of utilising 'floating' track construction over the two short sections of track that would cross peat with a depth greater than 0.3 m has been considered. Survey has shown

that the peat depths are at the lower limit of what is typically feasible for floating construction and the sections of track that would overlap with peat are short, so the transition from excavated to floating track and back again would result in little benefit from floating the two sections leading to Turbines T1 and T2.

- 4.6.22 On the MFD area, T3 is located in an area that as has an undulating depth of peat. The turbine has been moved a little west from its initial location to avoid an area of slightly deeper peat to its immediate east. As with all of the turbines, the associated infrastructure is configured to minimise areas of development, laydown areas and crane pads that encroach into areas of deeper peat.
- 4.6.23 T4, T5 and T6 are located on existing agricultural land on MFD that is used for grazing, so the peat resource was initially assumed to be minimal and was not surveyed as extensively by the phase 1 survey. However, as part of the phase 2 survey, following advice from NPTCBC, all three areas were extensively surveyed to document the depth of any peat in these areas, and shown by Figure 4.4 to be generally between 0 m – 0.3 m.
- 4.6.24 The design iteration reflects the refined detail available for the depths of peat shown by the survey results. Figure 4.4 shows the depths in line with the Soil Survey of England and Wales (1980) – which reflects advice and other assessments reviewed by both Land Quality Advice Service Wales and Natural Resources Wales. For transparency, the 0.5 m depth contour was retained, noting that this is also used as an indicator (as NPTCBC and NRW have previously).
- 4.6.25 One of the turbines on the MB area (T2, in 2022) has been removed from the design as a result of the Pre-Application Consultation (December 2022 – January 2023). Its removal from the proposed layout reflects the comments received from community consultees in respect of its proximity to Tonmawr and the perceived impacts this would have on residents. The identification numbers for the turbines have been altered from what was shown in the PAC (other than T1). The removal of one turbine will also reduce a corresponding number of vehicle movements (both abnormal loads and HGVs) travelling to and from the Site.
- 4.6.26 The blade tip height for T3 and T4 has been reduced from 220 m so that all four turbines proposed in the eastern part of the Site on Mynydd Fforch-dwm are a maximum of 200 m to tip. This means that some of the tower sections would be less wide and fewer AIL movements are required to access the Site.
- 4.6.27 The removal of one turbine and the reduction in height of two others reduces the visual impact of the Proposed Development. The potential for shadow flicker effects previously identified as being possible at Pelenna House is now eliminated due the turbine removal (2022 T2).

Maintaining Hydrological Flows

- 4.6.28 The creation of new access tracks, the solar array and wind farm infrastructure may alter runoff or local hydrology and thereby cause peat dewatering and/or have an effect on a groundwater dependent terrestrial ecosystem (GWDTE). The response to these potential effects are detailed in the chapter on hydrology, from paragraph 11.6.12 onwards. Good practice measures for the management of erosion and sedimentation mobilisation have been set out in a Peat Management Plan (Appendix 11.2) and Outline CEMP (Appendix 4.1).

Public Rights of Way

- 4.6.29 Public Rights of Way (PRoWs) were mapped onto the constraints plan used to design the layout of the Site. The PRoWs include footpaths, Byways and bridleways. Whilst there is no legislation or guidance about buffers or stand-off distances from PRoWs, consultation with

NPTCBC PRow officer was undertaken to agree an appropriate precautionary approach in relation to the amount of use of paths in the vicinity. This established that it is acceptable to locate the turbines a distance of 200 m away from a Bridleway, and 110 m from a public footpath.

- 4.6.30 The proposed turbine layout was shared with the Public Rights of Way officer at Neath Port Talbot, to inform a discussion on the proximity of the wind turbines and other elements of the Proposed Development to the PRow network. NPTCBC advised that the precautionary approach taken was appropriate, and that the distances between the wind turbines and PRow network was sufficiently large so that no issues were raised. As such, it is considered that the Proposed Development will not impact the use of the PRow network: no permanent diversions or stopping up orders are required.

Adjacent habitats and features

- 4.6.31 The location of each wind turbine was informed by Natural England's guidance note (TIN051) 'Bats and onshore wind turbines'. A standoff distance from the features that would be associated with the possible activity of bats in the countryside was applied to the initial constraints mapping (Figure 2.1). The use of this guidance and the output noted has been reviewed and agreed by Neath Port Talbot Council previously.

Glastir / Forestry planting at Mynydd Blaenavon

- 4.6.32 In August 2020, the landowner of some of the MB area of the Site received permission to afforest part of the Site for commercial forestry. The planting is now complete. As part of the design process, the turbine layout has responded to the constraints of this afforestation – which is most evident in the design of the route of the access track to turbine 2 (which is also influenced by peat constraints). No tree planting has taken place in close proximity to the location of proposed wind turbine T2, so as to ensure future tree growth remains beyond the recommended standoff distance in accordance with the guidance of Natural England Technical Information Note TIN051, Bats and onshore wind turbines interim guidance (2014, 3rd edition).

Micro-siting

- 4.6.33 The application seeks a micro-siting allowance for the wind turbines and associated infrastructure. The allowance which is being sought is up to 50m for wind turbines and 100m for internal wind farm tracks and other infrastructure such as switchgear buildings and compounds. This would allow minor changes to wind turbine locations at the construction stage and this allowance has been accounted for in the EIA process. Any micro-siting will comply with a 50m buffer from the edge of any bat habitat feature to the turbine tip.

5 Policy Context

5.1 Introduction

- 5.1.1 This section provides an overview of the international, national and local legislative and policy background relevant to the Proposed Development. An appraisal of the Proposed Development and its contribution to UK renewable energy targets is presented in the Planning Statement that accompanies the DNS planning application.

5.2 Legislative Context

- 5.2.1 The statutory basis for the Developments of National Significance (DNS) process is provided by the Planning (Wales) Act 2015, amending the Town and Country Planning Act 1990.

- 5.2.2 The principal legislative and procedural requirements are set out in the following;

- Town and Country Planning Act 1990
- Planning and Compulsory Purchase Act 2004
- Planning (Wales) Act 2015
- Well-being of Future Generations (Wales) Act 2015
- Environment (Wales) Act 2016
- Developments of National Significance (Wales) Regulations 2016
- Developments of National Significance (Procedure) (Wales) Order 2016
- Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) Regulations 2016 (as amended)
- Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended)
- Wales Act 2017

- 5.2.3 The Proposed Development is assessed in accordance with the above primary and secondary legislation, as amended.

5.3 Planning Policy

UK Energy Policy – Renewables

- 5.3.1 UK energy policy is not devolved to the Welsh Government and thus UK energy policy provides the applicable framework for the determination of relevant applications, such as the deployment of new onshore wind farms. The key UK wide energy policy comprises the following:
- The Clean Growth Strategy 2017- sets out the UK's legally binding climate objectives, including carbon budgets requiring the UK to reduce greenhouse gas emissions to 57% below 1990 levels.
 - National Policy Statement (EN-1)
 - National Policy Statement (EN-3)
- 5.3.2 The ES and supporting application documentation have regard to the above policy and the contribution the Proposed Development will have towards meeting UK targets.

Welsh National Planning Policy

- 5.3.3 Whilst the Welsh Government does not have devolved responsibility for energy policy, it benefits from such powers with regard to planning policy. It is through the mechanism of national planning policy that the Welsh Government is able to provide objectives to deliver the transition to low carbon deployment of electricity generation.
- 5.3.4 Relevant national planning policy comprises:
- Planning Policy Wales (Edition 11)
 - Future Wales – The National Plan 2040
 - Wales Spatial Plan (2008)
 - Energy Wales: A low carbon transition
 - Prosperity for All: A Low Carbon Wales (2019)
 - Technical Advice Notes (TANs)
 - Technical Advice Notes (TANs)
 - TAN 5: Nature Conservation and Planning
 - TAN11: Noise
 - TAN 12: Design
 - TAN13: Tourism
 - TAN15: Development and Flood Risk
 - TAN18: Transport
 - TAN24: Historic Environment
- 5.3.5 Future Wales: The National Plan 2040, is a part of the statutory development plan. It provides a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy and achieving decarbonisation and climate-resilience. Future Wales 2040 set out the national development plan context for energy and provides specific policies for heat network and renewable energy development.
- 5.3.6 Future Wales incorporates the following national policy targets on renewable energy:
- For 70% of electricity consumption to be generated from renewable energy by 2030;
 - For one gigawatt of renewable energy capacity to be locally owned by 2030; and
 - For new renewable energy projects to have at least an element of local ownership from 2020.
- 5.3.7 Future Wales states that the planning system plays a significant role in the provision of new renewable and low carbon energy and gives effect to the Welsh Government's national targets, setting the overall strategic framework and direction within which developers can proposed new energy infrastructure projects. Future Wales notes that "Wales can become a world leader in renewable energy technologies. Our wind and tidal resources, our potential for solar generation, our support for both large and community scaled projects and our commitment to ensuring the planning system provides a strong lead for renewable energy development, mean we are well placed to support the renewable sector, attract new investment and reduce carbon emissions".
- 5.3.8 The pre-assessed areas for wind energy alongside Policies 17 and 18 provide policy direction setting out requirements for DNS scale projects.

- 5.3.9 These pre-assessed areas have been identified by the Welsh Government and are considered, in principle, to be areas where DNS scale onshore wind projects of heights up to 250 m to tip would be acceptable subject to the criteria of Policy 17. Accordingly, there is a presumption in favour of large-scale onshore wind energy development and the associated landscape change, subject to the criteria within Policy 18.
- 5.3.10 The Site is located within 'pre-assessed area for wind energy (Area 9)', which means Policy 17 is relevant, yet there is emphasis on Policy 18 as it provides the criteria to frame assessment priorities and decision making.

National Guidance

- 5.3.11 Regard is also had to Welsh Government guidance relating to the DNS process. The guidance documents most relevant to EIA comprise:
- Developments of national significance guidance: environmental impact assessment (June 2019)
 - Developments of national significance guidance: habitats regulations assessment (June 2019)

Welsh National Development Framework - Evidence base "Resources"

- 5.3.12 The Welsh Government have published the "Assessment of on-shore wind and solar energy potential in Wales (Arup Report – July 2019)", which is relevant to the Proposed Development. Regard is had to this document in assessing the proposal.

Local Development Plan

- 5.3.13 The Proposed Development is located wholly within the administrative boundary of Neath Port Talbot County Borough Council (NPTCBC). The adopted development for the purposes of determining planning applications under the Planning and Compulsory Purchase Act 2004 is the Neath Port Talbot County Borough Council Local Development Plan (2011-2026), which was adopted in January 2016.
- 5.3.14 The key relevant policies to the Proposed Development are:
- Strategic Policy SP1 Climate Change
 - Strategic Policy SP15 Biodiversity and Geodiversity
 - Policy EN6 Important Biodiversity and Geodiversity Sites
 - Policy EN7 Important Natural Features
 - Strategic Policy SP6 Environmental Protection
 - Policy EN8 Pollution and Land Stability
 - Strategic Policy SP 14 The Countryside and Undeveloped Coast
 - Policy EN2 Special Landscape Areas
 - Strategic Policy SP18 Renewable and Low Carbon Energy
 - Policy RE1 Criteria for the Assessment of Renewable and Low Carbon Energy Development
 - Strategic Policy SP20 Transport Network
 - Policy TR1 Transport Proposals
 - Policy TR2 Design and Access of New Development

- Strategic Policy SP21 Built Environment and Historic Heritage
- Policy BE2 Buildings of Local Importance
- Policy SP22 Welsh Language

5.3.15 NPTCBC have also published a range of Supplementary Planning Guidance (SPG) documents to be considered as material considerations. The relevant SPGs are:

- Supplementary Planning Guidance – Landscape and Seascape
- Supplementary Planning Guidance – Biodiversity and Geodiversity
- Supplementary Planning Guidance - Pollution
- Supplementary Planning Guidance – Renewable and Low Carbon Energy
- Supplementary Planning Guidance - Design
- Supplementary Planning Guidance – The Historic Environment
- Supplementary Planning Guidance – Development and the Welsh Language.

6 Aviation, Telecommunications, Shadow Flicker and Safety

6.1 Aviation

- 6.1.1 Wind turbines have the potential to affect civil and military aviation. This section covers 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.
- 6.1.2 The aviation section has been prepared by Wind Power Aviation Consultants Ltd (WPAC).

Environmental Baseline

- 6.1.3 The Proposed Development is located 39 km to the north-west of Cardiff Airport and 27 km to the east-north-east of Swansea Airport. It is under Class G unregulated airspace and 16 km to the west of the Cardiff Control Area (CTA). The closest controlled airspace is an airway designated as the Strumble CTA, Class A controlled airspace which runs east/west and is over 5 km to the north of the site. The closest military airspace is the Pembrey Danger Area over 40 km to the west.

Legislation and Guidance

- 6.1.4 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.
- Civil Aviation Authority (CAA) (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;
 - 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 150 m Above Ground Level CAA.

Scope of the Assessment

- 6.1.5 The assessment of effects of the proposed turbines will be 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 is defined in Chapter 4 of that publication. These distances inform the size of the study area and include:

- Airfield with a surveillance radar – 30 km;
- Non radar licensed aerodrome with a runway of more than 1,100 metres – 17 km;
- Non radar licensed aerodrome with a runway of less than 1,100 metres – 5 km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP).
- Unlicensed aerodromes with runways of more than 800 metres – 4 km;
- Unlicensed aerodromes with runways of less than 800 metres – 3 km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

- 6.1.6 CAP 764 advises 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 and will be reported upon in this chapter.

Effects Scoped Out

- 6.1.7 Taking all of the above into account, on the basis of desk-based work and modelling undertaken, the professional judgement of the EIA team, the following topic areas have been 'scoped out' of detailed assessment (for further details see 'Existing Conditions' section below).

- MOD Air Defence Radar effects (none affected);
- MOD Air Traffic Control Radars (none affected);
- UK Met Office Meteorological Weather Radar effects (none affected);
- Bristol Airport Radar effects (as confirmed through consultation).

Assessment Methodology

- 6.1.8 Radar modelling has been undertaken 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 Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50 m and has a root mean square (RMS) error of 4 m. 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.
- 6.1.9 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 as well as performing calculations in the manner believed to be most appropriate, it also allows comparison with results 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 enabling 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.

6.1.10 The following data sources were consulted to inform the assessment:

- UK Military Aeronautical Information Publication (MIL AIP);
- UK Aeronautical Information Publications (AIP);
- CAA 1:250,000 VFR and 1:500,000 Charts;
- UK Military Low Flying Charts; and
- WPAC in-house databases.

Assessing Significance

6.1.11 Assessing significance in an aviation context is highly subjective as there is no agreed definition of significance. 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, considering 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 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."

6.1.12 Therefore, taking the above into account, it is not considered to be appropriate for the applicant to be making an assessment of significance of an effect in relation to aviation interests. It is also often the case that different Air Navigation Service Providers (ANSP) can take a different view of the same scenario and may disagree with the assessment findings leading to the need for further post submission consultation to confirm the findings of the assessment and/or agree to the need for and extent of mitigation.

Consultation

6.1.13 Initial consultation responses were received from aviation stakeholders as a result of EIA scoping and are reported below, however, the MOD was unintentionally omitted from the consultation process at that stage, so further consultation was initiated as part of this assessment.

Table 6.1 Consultation Responses

Consultee and Date	Issue Raised	Response
NATS and Cardiff Airport TOPA SG31193 Issue 1	Predicted impact on Cardiff Approach Radar, the assessment states: <i>'The proposed development has been examined by technical and operational</i>	The applicant has been in discussions with NATS and Cardiff Airport in relation to a technical mitigation solution.

Consultee and Date	Issue Raised	Response
	<i>safeguarding teams. A technical impact is anticipated, and this has been deemed to be unacceptable for the operation at Cardiff.'</i>	
MOD – November 2022	Mitigation required	Aviation lighting proposed

Potential Effects

6.1.14 The turbine layout within the proposed development has changed since scoping was completed and it is therefore essential to determine what the effect will be on aviation stakeholders – the following section assesses the effect on radar and other aviation issues in accordance with the guidance in CAP 764.

6.1.15 Cardiff Airport - the turbines are located between 38 and 39.5 km to the north-west of the radar at Cardiff Airport. Radar modelling has been undertaken with the results shown in Table 6.2.

Table 6.2 Radar Line of Sight Cardiff Airport Radar

Turbine	Radar Line of Sight (m AGL)
1	107.4
2	124.8
3	163.2
4	189
5	107
6	105.6

6.1.16 These results show that the turbines will all be in line of sight of the radar and have the potential to create 'clutter' (unwanted random radar returns) and obscuration on the radar displays at the airport. Whilst there are number of existing wind farms in the area that will also be visible to the radar, it is clear that the Proposed Development will add to the potential radar clutter in this area.

6.1.17 NATS En Route Ltd (NERL) - the two closest radars in the NERL network with the lowest coverage are at Burrington in Devon and Clee Hill in Shropshire. Radar modelling has been undertaken which shows there is no radar line of sight below 600 metres AGL for Clee Hill and 590 metres AGL for the Burrington radar. The Proposed Development will have no effect on any NERL Communications, Navigation or Surveillance (CNS) infrastructure. This will be confirmed by NERL in response to the planning application.

Aviation Lighting

6.1.18 Wind turbines with a tip height in excess of 150 m are required to be illuminated with medium intensity red aviation obstruction lights installed on the turbine hub in accordance with the Civil Aviation Authority 'Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level'. The applicant has provided a lighting scheme that fulfils the requirements for flight safety whilst minimising environmental effects and will gain approval from the CAA for the

design. Additionally, refer to ES Appendix 6.1 'Wind Farm Aviation Lighting and Mitigation Report for Mynydd Fforch Dwm Wind Farm v2.0'. This has also been used to inform the LVIA, ES chapter 7.

Mitigation

- 6.1.19 Cardiff Airport Radar - the turbines will all be in radar line of sight of the radar at Cardiff Airport. As a result of discussions with both NATS (the Air Navigation Service Provider (ANSP)) and the airport management, it was agreed, that in common with several other wind farm developments in South Wales, it would be technically feasible to mitigate the effects of the turbines in order to enable Cardiff to continue to provide radar-based ATC services in the vicinity of the wind farm after the turbines begin operating. There are at least two possible technical solutions that have been discussed, the most likely being the installation of a Terma Scanter 4002 radar at the airport. This type of radar has already been installed at several airports in the UK specifically to provide wind farm mitigation, including at Glasgow, Edinburgh, Prestwick, Newcastle and Inverness. This process can be covered by the imposition of a suitably worded planning condition, as was recently agreed for the nearby Upper Ogmere wind turbine scheme.

Summary

- 6.1.20 This is a relatively uncomplicated development from an aviation perspective. The turbines will be visible to the radar at Cardiff Airport and a technical mitigation scheme will become available, subject to contractual agreements between the applicant and the airport and the imposition of a planning condition to protect the interests of the airport. The only other mitigation required is for aviation lighting to fulfil the requirements of both the CAA and the MOD, again, controlled through the imposition of a planning condition.

6.2 Shadow Flicker

6.2.1 Shadow flicker may occur under certain combinations of geographical position and time of day, when the sun passes behind the rotors of a wind turbine and casts a shadow over neighbouring properties. As the blades rotate, the shadow flicks on and off, an effect known as shadow flicker. The effect can only occur inside buildings, where the flicker appears through a window opening.

6.2.2 The likelihood and duration of the effect depends upon:

- The direction and aspect of the property relative to the turbine(s): in the UK, only properties within 130 degrees either side of north, relative to the turbines, can be affected, as turbines do not cast long shadows on their southern side;
- distance from turbine(s): the further the building is from the turbine, the less pronounced the effect would be, given the shadow fades with distance. Flicker effects are known to be strongest and most likely to have the potential to cause significant effects within ten rotor diameters of a turbine;
- turbine height and rotor diameter;
- time of year and day; and
- weather conditions (i.e., cloudy days reduce the likelihood of effects occurring).

6.2.3 If shadow flicker cannot be avoided through layout changes, then technical mitigation solutions are available, such as shutting down the turbines which cause the effect when certain conditions prevail.

6.2.4 Shadow flicker effects are only considered during the operational phase of a wind farm development.

Policy and Legislative Context

National Policy

6.2.5 Planning Policy in Wales relevant to the Proposed Development relating to shadow flicker is set out in Future Wales and Planning Policy Wales (PPW). Under criteria 7 of Policy 18 of the national plan, proposals are required to demonstrate there are no unacceptable adverse impacts to receptors by way of shadow flicker, noise etc.

6.2.6 Paragraph 5.9.20 of PPW requires planning authorities to minimise impacts on local communities and safeguard the quality of life of existing and future generations.

6.2.7 Policy 18 – Renewable and Low Carbon Energy Developments of National Significance of the Future Plan, states that “*Proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance will be permitted subject to policy 17 and the following criteria:*

- *7) there are no unacceptable adverse impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic disturbance.”*

6.2.8 These requirements place a duty on the Applicant to set out the methods of assessing shadow flicker and determining the level of significance to receptors. Within Wales there is no standard for the assessment of shadow flicker and there are no guidelines on what exposures would be acceptable, therefore this assessment seeks to quantify the effect.

6.2.9 Relevant reference documents include the Update of UK Shadow Flicker Evidence Base (2011), DECC¹. This reviewed the English, Welsh and Scottish guidance on shadow flicker, which is broadly similar, concluding that:

- Shadow flicker only occurs inside buildings where the flicker appears through a narrow window opening;
- Only properties within 130 degrees either side of north of the turbines can be affected at UK latitudes; and
- Shadow flicker has been proven to occur only within ten rotor diameters of a turbine position.

6.2.10 There is no formal limit on the amount of shadow flicker that is considered acceptable within the UK. Other European countries do have limits, and these vary from one country to another. A typical limit, which has been utilised in Northern Ireland², Republic of Ireland, Germany and Belgium, is 30 hours per year with a maximum of 30 minutes per day. Since there is no formal guidance on this subject in the UK, the discussion of the results relative to these limits is for reference purposes only.

Local Development Plan

6.2.11 The relevant Local Development Plan is the Neath Port Talbot Local Development Plan 2011-2026, adopted January 2016. Policy RE 1 Criteria for the Assessment of Renewable and Low Carbon Energy Development, paragraph 5.3.97 which states “All schemes will need to demonstrate that the proposal would not cause any unacceptable impacts to the environment and the amenity of local residents or communities. Particular regard will be given to the potential impact on the landscape, townscape or seascape, nature conservation, wildlife interests, areas of historical and cultural importance and the potential for pollution, noise, dust, vibration, reflected light and shadow flicker”.

6.2.12 No further guidance on study areas or assessment criteria is provided above that provided at national level.

Study Area

6.2.13 In line with best practice guidance, a study area based on a distance of 10 rotor diameters from the proposed wind turbines has been employed to determine the zone of potential shadow flicker incidence of a proposed development. The candidate wind turbines modelled in the assessment have a rotor diameter of 150 m, this gives a study area of 1,500 m from the turbines. In addition to this a further 50 m area was added to the 10-rotor diameter distance in order to account for potential micro siting should the Proposed Development receive consent (total study area = 1,550 m).

6.2.14 The maximum study area for the Proposed Development was mapped using GIS software. This was then refined to include only the areas within 130 degrees of north of proposed wind Northern Ireland Department of the Environment (2009) Best Practice Guidance to PPS 18 Renewable Energy turbine locations. Properties within the study area and within 130 degrees

¹ DECC (2011) Update of UK Shadow Flicker Evidence Base

² Northern Ireland Department of the Environment (2009) Best Practice Guidance to PPS 18 Renewable Energy

of north were identified from OS Address Base data, Google Earth and OS Mapping. 60³ properties were identified within the shadow flicker study area. Figures 6.1a and 6.1b show the location of these properties.

Cumulative Study Area

- 6.2.15 Pen y Cymoedd, an operational wind farm, is located to the immediate north, east and south of the eastern cluster of the Proposed Developments wind turbines. A 10-rotor diameter study area for Pen y Cymoedd has therefore been incorporated into Figure 6.1 to establish the potential or otherwise for cumulative shadow flicker effects.
- 6.2.16 As can be seen in Figure 6.1, whilst the study areas overlap, no residential property within the Proposed Development's study area also lies within Pen y Cymoedd's study area.
- 6.2.17 Therefore, cumulative shadow flicker effects are not considered further within this chapter.

Methodology

- 6.2.18 The shadow flicker assessment comprises numerical modelling of the proposed turbines and receptors within the defined study area. It is noted that whilst there are several computer models available, the DECC study (2011) confirms that there are limited differences between outputs of the various packages. For Shadow Flicker assessments, SLR Consulting use one of the industry standard software packages, ReSoft Wind Farm software (version 5.1.2.1).
- 6.2.19 The calculations from this assessment process assume a worst-case scenario based on the sun shining during all daylight hours over the course of a year, no obscuring features (such as trees, hedges, other buildings) being present, the face of the rotor always being aligned towards the dwelling, and that the rotor is always turning (i.e., the wind is always blowing between 4 m/s and 25 m/s, and no account is taken of shut down periods for maintenance). This methodology yields a theoretical maximum indication of potential shadow flicker incidence, together with the times of day, and dates during the year when potential incidence may occur.
- 6.2.20 The software performs calculations to determine the position of the sun throughout the year, and thus during what times of day it will theoretically cast a shadow across the windows of nearby houses within 10 rotor diameters (plus 50 m micro siting). Data input into the model where shadow flicker assessment is required is as follows:
- The locations of all properties within ten times the rotor diameter (plus an allowance of 50 m for micro siting) and 130 degrees either side of north of any turbine;
 - The dimensions and orientations of windows facing the proposed development;
 - The surrounding topography (Ordnance Survey Digital Terrain Model); and
 - The locations and dimensions of the turbines.

³ Some properties may be clustered into one reference property, e.g., properties on the same street.

6.2.21 The following sources of information outlined in Table 6.3 were used to inform this assessment.

Table 6.3 Sources of Information

Topic	Source of Information
Residential properties Location in relation to Proposed Development and identification of windows.	Ordnance Survey (OS) 1:25,000 Mapping Google Earth Street View Bing Maps Birds Eye View
Topography Height data	OS 5 m DTM data

6.2.22 In practice it is likely that shadow flicker effects would occur for considerably less time than the worst-case predictions, for the following reasons:

- in the UK, sunshine typically occurs for approximately 30% of daylight hours. At other times, the wind turbines are unlikely to cast shadows sufficiently pronounced to cause shadow flicker effects to occur; and
- at times when the wind turbine rotor is not oriented directly towards the property, the duration of shadow flicker effects would be reduced due to the elliptical shape of the shadow cast.

6.2.23 The assessment has been undertaken assuming a worst-case scenario which does not take into consideration the screening effect of anything located between the wind turbines and the property and as such the actual effect would likely be even less.

Limitations to the Assessment

6.2.24 There are several additional factors that can influence the amount of shadow flicker actually experienced and these cannot be readily included in a computer-based assessment.

6.2.25 Climatic conditions dictate that the sun is not always shining. The closest Met Office location is Mumbles Head (Swansea) however this station does not record sunshine hours. The next closest is St Athan, approximately 35 km from the Proposed Development.

6.2.26 Historic Met Office data (over the period 1991–2020) gives actual sunshine hours for the St Athan Met Station to be on average 38.6% of total daylight hours (average sunshine hours of 1,692 / total number of daylight hours 4,380 = 38.6%). Cloud cover during other times may obscure the sun and prevent shadow flicker occurrence. While some shadows may be cast under slightly overcast conditions, no shadow at all would be cast when heavy cloud cover prevails.

6.2.27 During calm periods, or very high winds, the wind turbine blades would not rotate and shadow flicker would not occur. Turbines would also be periodically shut-down for maintenance or repair work.

6.2.28 Wind turbines automatically orientate themselves to face the prevailing wind direction. This means that the turbine rotors would not always face directly towards the occupied buildings. Under some wind conditions, the proposed turbines would face 'side-on' to properties, and in these conditions only a very small area of blade movement would be visible.

- 6.2.29 Any screening provided by vegetation or structures has not been incorporated as the analysis has been run on bare ground terrain data.

Assessment of Significance

- 6.2.30 Whilst the time and duration of shadow flicker events can be predicted accurately, the level of the effect is difficult to quantify as this would depend on the location of windows within a property, the use of the rooms affected, the level of shading surrounding the property and how susceptible the receptor is to light flicker.
- 6.2.31 As confirmed by the DECC study (2011), there is no standard Scottish or UK guidance relating to a limit for shadow flicker. The only guidance providing additional recommendations is the aforementioned Northern Irish PPS 18 (2009) guidance which recommends that for properties within 500 m of the turbines, shadow flicker should not exceed 30 hours per year or 30 minutes per day.
- 6.2.32 The assessment has therefore adopted a criterion of 30 hours of shadow flicker in one year as a significance threshold. Where less than 30 hours of shadow flicker is predicted to occur in one year at a particular property, this is considered to be a minor effect (not significant), with significance increasing in relation to the number of hours (over 30) of shadow flicker per year, in accordance with best practice guidance.
- 6.2.33 Whilst the distance between turbine and property does not affect the calculated shadow flicker exposure times, it does mean that the actual effect (i.e., the total exposure time and flicker intensity combined) of the Proposed Development would, in reality, be less than that calculated as a worst-case.

Baseline Conditions

- 6.2.34 A number of residential properties have been identified which fall within the 1,550 m study area. These properties could theoretically be affected by shadow flicker from the Proposed Development (Figure 6.1). Approximately 12 properties fall within the study area, although some groups of properties have been clustered together into a single representative property, such as properties on the same residential street.

Assessment of Effects

- 6.2.35 Figure 6.1 shows the potential zone of shadow flicker effects. Based on the predictive modelling technique outlined above, there is predicted to be shadow flicker effects at one property of up to 62.7 hours per year at Fforch-dwm arising from turbines 1, 2 and 3 (shown in Table 6.4), assuming the worst-case scenario.
- 6.2.36 The results shown in Table 6.4 are based on the 'worst-case scenario', which includes the potential for micro siting leading to a turbine being moved up to 50 m closer under the micro siting allowance sought. Only the property predicted to experience shadow flicker is shown in the table. The remaining properties identified in Figure 6.1 are not expected to experience shadow flicker, due to a combination of their location in relation to the wind turbines, and the topography of the area. This can be seen in Figure 6.2.

Table 6.4 Shadow Flicker Assessment Outputs

No.	Property	Days per Year Where Shadow Flicker Potentially Experienced	Turbine(s) Causing Effect	Distance from nearest turbine	Max Minutes per Day Where Shadow Flicker Potentially experienced	Max Total Hours per Year When Shadow Flicker Potentially Experienced	Likely Total Hours per Year When Shadow Flicker Potentially Experienced ⁴
1	Fforch-dwm	58	1, 2 and 3	573 m	69.6	50.5	19.5

Analysis of Results

- 6.2.37 The results confirm that of the properties assessed in the worst-case model, one could experience over 30 hours of shadow flicker in a year, Fforch-dwm (Property labelled 1). Shadow flicker effects on this property could arise in the early evening in spring and summer from turbine 1, and in early morning in the summer from turbine 3. Based on the significance criteria outlined earlier, the shadow flicker effects on this property would be Significant without mitigation.
- 6.2.38 It is likely in practice actual hours of shadow flicker would be considerably less than this due to the wind not always blowing and the sun not always shining. When average sunshine hours are applied to the results it is likely Fforch-dwm could experience less than 20 hours per year of shadow flicker.
- 6.2.39 No other properties are anticipated to experience any shadow flicker effects as a result of the Proposed Development.

Mitigation

- 6.2.40 Shadow flicker effects could potentially occur as a result of the Proposed Development, based on a worst-case scenario. Although shadow flicker levels are likely to fall to below the 30-hour per annum significance threshold based on the average sunshine hours expected at the Site and some existing vegetation screening, the Applicant is committed to promptly investigating any complaints of shadow flicker and taking appropriate action as required.
- 6.2.41 If a complaint is made regarding shadow flicker, an investigation would take place which considers the weather conditions at the time of the alleged shadow flicker, to determine which turbines were, or were not, creating the effect and the extent of the shadow flicker created. If the investigation confirms a loss of residential amenity, then mitigation built into these turbines would be implemented.
- 6.2.42 The shadow flicker control module consists of bespoke software, a clock, a timer, a switch, a wind direction sensor and a light sensor. The module can control a specific turbine (or turbines) which would be programmed to shut down on specific dates at specific times when the sun is bright enough, there is sufficient wind to rotate the blades and the wind direction is such that nuisance shadow flicker could occur. There is no specific UK guidance regarding

⁴ Based on the 38.6% average sunshine hours from the nearest Met Office Weather Station.

what level of light is sufficient to cause a shadow flicker event. However, the actual light level that would trigger a turbine shut down can be manually configured onsite, following installation, to reflect local conditions.

- 6.2.43 A planning condition would provide an appropriate form of mitigation to ensure that any complaints would be investigated within a reasonable timescale and that the rectification of any substantiated shadow flicker issue would be implemented promptly and effectively. As noted in the DECC guidance (2011) states that *“Mitigation measures which have been employed to operational wind farms such as turbine shut down strategies, have proved very successful, to the extent that shadow flicker cannot be considered to be a major issue in the UK”*.

Residual Effects

- 6.2.44 Following implementation of mitigation deemed to be necessary in the event of a complaint, it is considered that there will be no significant effects in relation to shadow flicker as a result of the Proposed Development.

6.3 Telecommunications and Television Interference

Telecommunications

- 6.3.1 British Telecom (BT), Mobile Broadcast Network Limited (MBNL), Virgin Media O2, and Vodafone have confirmed they have no objections to the Proposed Development based on the current turbine layout.
- 6.3.2 Dwr Cymru (Welsh Water) has confirmed no objections to the Proposed Development based on the current turbine layout.
- 6.3.3 Following further analysis undertaken by the Joint Radio Company (JRC) an initial objection to the proposed development was removed. Therefore, the JRC have no objections to the Proposed Development based on the current turbine layout.
- 6.3.4 Arqiva provided details of their communications infrastructure in the area, accompanied by an objection to one turbine location. The subsequent 2D analysis has shown that wind turbine 1 (T1) infringes the exclusion zone associated with the link path. The mitigation of this has been analysed and a viable response has been identified by the operator.

Mitigation

- 6.3.5 Due to an infringement of the exclusion zone, mitigation will be a requirement for T1. An agreement with Arqiva will be made to ensure that a suitable form of mitigation is implemented.

Television Interference

- 6.3.6 Impacts on television reception are likely to be small and may not be noticeable at all in practice because terrestrial coverage in the area is provided by a large number of relay transmitters due to the varying terrain which already affects coverage significantly. The localised areas of coverage mean that the wind development is not predicted to lie in between a transmitter and an area to which it provides coverage.
- 6.3.7 Impacts on satellite television reception are not anticipated because dwellings are not located within the shadow zones associated with the proposed wind turbines.

Recommendations

- 6.3.8 No requirement for pre-emptive mitigation has been identified. Any reported effects following construction of the development should be investigated specifically in the context of whether they occur in an area that is in the forward scatter region for the transmitter providing coverage.
- 6.3.9 Further data regarding the baseline coverage environment, which would also increase the accuracy of subsequent investigations of reported interference, could be collected via a physical reception survey prior to construction of the wind turbines.

6.4 Major Accidents and Disasters

Risk from Mine Works

- 6.4.1 Generally, where mine workings are identified as <20 metres (approximately) from surface, this should be considered as a high risk for any future potential development. If the mining has taken place between 20-30 metres, this represents a medium risk, and in excess of 30 metres, a low risk.
- 6.4.2 The shallowest seam present below the site is the Mountains Seam, at depths projected to be approximately 65 m below the site (see Appendix 11.3).
- 6.4.3 There is confirmed evidence of mining having occurred below the site on the Mountain Seam. Furthermore, it is apparent that the risk should be considered Low due to the significant thickness of cover (60-65 m) on two leaves, typically mined at less than ~1 m thick each. This cover would mitigate risk to any future development by minimising potential migration of mining cavities/voids from possible underground workings. Even with a worst-case scenario of a 2.5 m void (utilising a maximum thickness of the Mountain Seam of 2.5 m assuming both leaves were worked), there is sufficient rock cover at a ratio of 10:1 (rock cover to mining void) to mitigate risk. Finally, the actual redevelopment is considered very Low Risk with low ground loadings which are unlikely to initiate any potential significant settlement issues.
- 6.4.4 Furthermore, there is no record of mine gas emissions requiring action by the Coal Authority within the site boundary.

Risk from Natural Disaster and Extreme Weather

- 6.4.5 It is not considered that the Site is vulnerable to natural disasters or extreme weather events. The Scoping Direction (Appendix 3.2) stated "*the Local Authority agrees that this area is not known to experience natural disaster and extreme weather events*". Wind turbines are designed to withstand extreme weather conditions, with mechanisms to shut-down the turbines during extreme wind and to conduct lightning to the ground during storm conditions, for example. Therefore, natural disasters and extreme weather events have not been assessed further in this ES.

Glint and Glare

- 6.4.6 The Solar Photovoltaic Glint and Glare Study (Appendix 6.4) assessed the potential for glint and glare impacts from the solar component of the Proposed Development. The study made the following conclusions:
- Solar reflections are not geometrically possible towards the assessed 0.7 km section of Ton Mawr Road. No impacts are predicted, and no mitigation is required.
 - Solar reflections are geometrically possible towards 28 of the 118 assessed dwellings. Screening in the form of intervening terrain is predicted to obstruct views of reflecting panels, therefore no impact is predicted and no mitigation requirement has been identified.
 - No impacts are predicted upon road safety and residential amenity, and no mitigation is recommended.
- 6.4.7 Given the conclusions set out above, it is not considered likely that significant effects relating to glint and glare will result from the Proposed Development.

7 Landscape and Visual Impact

7.1 Introduction

Background

- 7.1.1 Stephenson Halliday was commissioned in July 2020 to prepare a landscape and visual impact assessment (LVIA) of Mynydd Fforch Dwm Wind Farm on behalf of the Applicant.
- 7.1.2 This assessment defines the existing landscape and visual baseline environments; assesses their sensitivity to change; describes the key landscape and visual related aspects of the proposed development; describes the nature of the anticipated changes and assesses the effects arising during construction and once completed.

The Site and Proposals

- 7.1.3 The Site is described in detail in Chapter 2: Site Description. In summary it comprises the main areas where the proposed wind turbines, solar array and related infrastructure would be located, including a site access route. In addition, there is also a grid connection corridor to the west. Figure 4.15 places the Proposed Development within its local context.
- 7.1.4 The Site occupies open ground and forestry between the valleys of Vale of Neath to the northwest and Cwm Afan to the south, adjacent to the south west of the operational Pen y Cymoedd wind farm, and with the site access route approaching the site via Neath, Efail-fach and Tonmawr. The prevailing wider landscape pattern is of open and/or forested bands of upland set between valleys which contain transport corridors and villages set within a small-scale farmland field pattern with hedgerows, deciduous woodland and trees. Dispersed farms and individual dwellings occur occasionally throughout the area – typically being situated on the lower slopes above the settled valleys. Larger settlements and major transport corridors are situated closer to the coast to the southwest and west of the site.
- 7.1.5 The grid connection will be subject to a separate application but the likely design and effects are described within the assessment. The on and offsite grid connections are anticipated to consist of a mix of underground cable and overhead wooden pole lines (responding to localised constraints and sensitivities), and to extend south west from the wind farm site towards a proposed connection with an existing substation near the M4, west of Baglan.

Competence

- 7.1.6 This chapter along with the design and mitigation of the Proposed Development has been prepared by Chartered Landscape Architects at Stephenson Halliday. The Practice has over 24 years of experience working on over 100 wind energy proposals throughout the UK. Key individuals working on this project have over 20 years of experience as chartered landscape architects.
- 7.1.7 The Practice is a Landscape Institute and IEMA registered practice and all work is prepared and reviewed internally by senior highly experienced landscape planners with Public Inquiry experience.
- 7.1.8 To inform the assessment, site visits were made to various locations within the study area including, but not restricted to, representative viewpoints by Stephenson Halliday's assessment team during summer and autumn 2022.

Stakeholder Consultation

- 7.1.9 Neath Port Talbot County Borough Council (NPTCBC) and Natural Resources Wales (NRW) were consulted in relation to: the scope of the assessment; the selection of viewpoints, and the extent of the LVIA study area at the pre-application and scoping stage.
- 7.1.10 NPTCBC and the local community were also consulted in relation to the design of the proposed wind farm and their comments have been taken into account - in particular in relation to the scale and appearance of the turbines in views from Tonmawr.
- 7.1.11 The key responses are detailed below in Table 7.1: Summary of Stakeholder Consultation. The final list of viewpoints agreed through consultation is described separately in Table 7.7.

Table 7.1 Summary of Stakeholder Consultation

Consultee	Issue	How this is addressed
PEDW / NRW	PEDW agrees with NRW that GN046 should be applied even if the Site is located within a pre-assessed area.	A LANDMAP analysis following GN046 guidance is provided as Appendix 7.6.
PEDW / NRW	The Study area should also be expanded to 26-28 km. Night-time study area should include viewpoints within the national park.	For simplicity, the study area and cumulative search area have been set at 30km, with the detailed study area set at 15km. Viewpoints and special qualities within nationally designated landscapes are considered within 30km. This applies to both day and night-time assessments.
NPTCBC	15km detailed study area; 20km cumulative study area and 15km night-time study area are acceptable.	
PEDW / NRW	The scoping request states that significant effects will only be likely within 5 to 6 km of the Site. This should be demonstrated through the assessment presented in the ES. NRW consider that significant effects are likely to occur beyond 5-6km and potential effects on highly sensitive areas such as the National Park and AONB should be included in the assessment.	Assessment of effects on the AONB and National Park is provided at section 7.6.
PEDW / NRW / NPTCBC	NPTCBC and NRW are requesting additional viewpoints. The ES should include the additional viewpoints.	NPTCBC did not request additional viewpoints in relation to the LVIA scope. In relation to the scope of the socio-economic assessment they suggested views from Bryn Bettws Lodge (close to LVIA viewpoint 3) may be important to that business. NRW suggested that a more open location on Comin y Rhos may be found to the south of viewpoint 13 and that location has been used for viewpoint 13 in this LVIA instead of the location proposed at scoping.
PEDW / NPTCBC	The grid connection given its substantial distance should be included within the assessments as well as the visual impacts associated with the solar array. Photomontages should also include the solar arrays where visible	All aspects of the Proposed Development are considered within the LVIA. Solar panels, tracks and other site infrastructure are included in visualisations where they would be visible. The grid connection will be subject to a separate application, but the likely design

Consultee	Issue	How this is addressed
		and effects are described within the assessment.
NPTCBC	2km radius Residential Visual Amenity Assessment (RVAA) study area is acceptable.	See Appendix 7.5 for the RVAA.
PEDW / NRW	Cumulative impact assessment should not be limited to other wind farm development as other projects could be relevant. It should be noted that the development also includes c.20ha of solar arrays thus solar farms should also be considered. PEDW does not agree that turbines under 50 m in height should only be considered if are located within 5 km of the proposed turbines as this is not in line with any guidance. NRW requested that Maesgwyn wind farm and extension should be included in the cumulative assessment.	All notable developments within 30km have been considered within this EIA (see Section 3.6and Figure 3.1). Section 7.11 sets out how these have been considered within this LVIA.
NRW / NPTCBC	At least one of the viewpoints in the national park should be considered in relation to night-time effects. There may be a requirement for night photomontages from more than 2-3 locations in total. NPT accept the proposed scope of night-time assessment (including 2-3 photomontages).	Night-time effects are considered for all viewpoints, informed by wirelines which show the expected visibility of the aviation lights. Viewpoint 13 is included as a night-time photomontage, as are viewpoints 6 and 7. Given the inclusion of lighting on wirelines and the limitations of night photomontages in representing lighting as seen by the human eye on site, it is judged that further photomontages would not augment the assessment provided.
NPT – response to draft ES consultation (letter dated 23 Jan 2023)	Request clarification of why lights are seen in the night time photograph from viewpoint 13.	Clarification was provided as follows: As referenced in the earlier correspondence there were two potential locations for viewpoint 13 which are quite close together. For the daytime view both were photographed and the more open location at Comin y Rhos was used. For night-time only one was photographed. That location is adjacent to a campsite - the lights shown are within the campsite. This still represents the night-time environment in the vicinity – which includes the campsite some lighting associated with homes and moving vehicles. Given this it was not considered proportionate to re-photograph at a different location.
NPT – response to draft ES consultation (letter dated 23 Jan 2023)	Provide comments on various other elements of the draft ES, including study areas, cumulative scope and assessment outcomes. No disagreement is indicated.	No action required

Study Area

- 7.1.12 It is accepted practice within landscape and visual assessment work that the extent of the study area for a development proposal is broadly defined by the visual envelope of the proposed development. In this case a study area of 30km has been used (as shown by Figures 7.5 and 7.9).

Report Structure and Terminology

- 7.1.13 Supporting appendices have been prepared that supplement the sections regarding methodology, planning policy and baseline. The appendices (7.1 - 7.6) are important to the assessment and should be read alongside this report/chapter.
- 7.1.14 Key terms used within the assessment are described in Section 7.3 and Appendix 7.1 which set out the methodology and glossary.

7.2 Policy Context

National Planning Policy

- 7.2.1 Current planning policy in Wales is set out within Future Wales, The National Plan 2040 (FW) and Planning Policy Wales (PPW).
- 7.2.2 Technical studies to identify candidate areas for large scale wind (>10MW) and solar farms (10-50MW) were issued during 2019 as part of the 'Assessment of onshore wind and solar energy potential in Wales', as follows:
- Stage 1 - Development of Priority Areas for Wind and Solar Energy (March 2019);
 - Stage 2 - Refinement of Priority Areas for Wind and Solar Energy (July 2019); and
 - Executive Summary Stages 1 and 2 (July 2019).
- 7.2.3 The outcomes from these studies were used to inform FW, which includes 'pre-assessed areas' for wind development including turbines up to 250m tip height, but not for solar development. The inclusion of the site within Pre-Assessed Area 9 indicates there is landscape capacity for wind energy of this scale in this area, subject to a detailed assessment of site constraints and effects arising from development.
- 7.2.4 This is reinforced by the Future Wales Policy 17 which states that
- "In Pre-Assessed Areas for Wind Energy the Welsh Government has already modelled the likely impact on the landscape and has found them to be capable of accommodating development in an acceptable way. There is a presumption in favour of large scale wind energy development (including repowering) in these areas, subject to the criteria in policy 18."*
- 7.2.5 Within Policy 18 the only relevant criterion in relation to landscape and visual impact for wind farms within pre-assessed areas is that *"there are no unacceptable adverse visual impacts on nearby communities and individual dwellings"*. In terms of scoping an LVIA, Policy 18 also indicates that *"The cumulative impacts of existing and consented renewable energy schemes should also be considered"*.
- 7.2.6 In relation to the solar elements of the proposal, Policy 18 (1) requires that *"the proposal does not have an unacceptable adverse impact on the surrounding landscape (particularly on the setting of National Parks and Areas of Outstanding Natural Beauty)"*.

- 7.2.7 Section 6.3 of PPW sets out policy in relation to landscape, setting out considerations with respect to nationally designated landscapes and landscape character.
- 7.2.8 Effects on nearby communities, nationally designated landscapes and landscape character are considered in sections 7.4 (baseline) and 7.6 (potential effects). Cumulative impacts are considered in section 7.11 (cumulative effects) and visual effects on individual dwellings are considered in Appendix 7.5 Residential Visual Amenity Assessment.

Local Planning Policy

- 7.2.9 The Proposed Development is located wholly within the administrative boundary of Neath Port Talbot County Borough Council (NPTCBC). Current local planning policy is described in the Neath Port Talbot County Borough Council Local Development Plan (2011-2026). The Neath Port Talbot Council Replacement Local Development Plan (RLDP) (2021-2036) is not anticipated to be adopted until 2025 and so is not considered as part of this assessment.

Neath Port Talbot County Borough Council Local Development Plan

- 7.2.10 Relevant sections of policies are identified in the following paragraphs.

- 7.2.11 Strategic Policy SP14: The Countryside and Undeveloped Coast

"The countryside and undeveloped coast, including landscapes, seascapes and agricultural land, will be protected and where feasible enhanced"

- 7.2.12 Effects on landscape character are considered in sections 7.4 (baseline), 7.6 (potential effects), 7.7 (night-time effects) and 7.11 (cumulative effects).

- 7.2.13 Policy EN2: Special Landscape Areas (SLAs) contains specific provision in relation to development within SLAs which does not apply to the Proposed Development. It also requires that:

"In the case of renewable energy developments, it will need to be demonstrated that component elements have been designed and sited to minimise visual intrusion and adverse effects on the landscape."

- 7.2.14 Effects on SLAs are considered in sections 7.4 (baseline), 7.6 (potential effects) and 7.11 (cumulative effects).

- 7.2.15 Policy EN7: Important Natural Features seeks to ensure the retention and protection of "ecologically or visually important natural features such as trees, woodlands, hedgerows / field boundaries, watercourses or ponds".

- 7.2.16 Effects on landscape fabric are considered at section 7.6.5.

- 7.2.17 Strategic Policy SP18: Renewable and Low Carbon Energy includes (inter alia) *"Ensuring that development will not have an unacceptable impact on the environment and amenity of local residents."* and this is echoed by Policy RE 1 Criteria for the Assessment of Renewable and Low Carbon Energy Development.

- 7.2.18 Visual effects are considered at sections 7.4 (baseline), 7.6 (potential effects), 7.7 (night-time effects) and 7.11 (cumulative effects), and effects on residential visual amenity are considered in Appendix 7.5.

Local Guidance

- 7.2.19 In addition to the policy documents identified above, there are relevant local Supplementary Planning Guidance (SPG) guidance and baseline documents as follows:

NPTCBC LANDMAP Landscape Assessment SPG (2004)

- 7.2.20 This SPG is a landscape characterisation of the borough based on the LANDMAP process. It is used as the primary reference for local landscape character within this assessment.

Carmarthen Bay, Gower and Swansea Bay Local Seascape Character Assessment (2017)

- 7.2.21 This document provides a characterisation of seascape within the study area. Effects on seascape are not included within the scope of this assessment given the Proposed Development is located some distance inland.

NPTCBC Landscape and Seascape Supplementary Planning Guidance (2018)

- 7.2.22 This SPG references both of the two documents described above and provides details in relation to the local SLA designations. It is used as the primary source of reference for the valued qualities of the SLAs.

NPTCBC Renewable and Low Carbon Energy Supplementary Planning Guidance (2017)

- 7.2.23 This SPG contains some advice on LVIA for renewables, however this does not include any variations to best practice guidance taken account of in the preparation of this LVIA.

NPTCBC The Historic Environment Supplementary Planning Guidance (2019)

- 7.2.24 This SPG relates primarily to heritage matters, but is referenced within this LVIA in relation to the valued characteristics of Conservation Areas and Historic Parks and Gardens.

7.3 Assessment methodology

- 7.3.1 The detail of the methodology is described in Appendix 7.1. A summary of the primary judgements is provided below.

Sensitivity

- 7.3.2 Sensitivity is judged taking into account the component judgments about the value and susceptibility of the receptor as illustrated by the table below. Where sensitivity is judged to lie between levels, an intermediate assessment will be adopted. A slightly greater weight is given to susceptibility in judging sensitivity of visual receptors as indicated below:

Table 7.2 Landscape Sensitivity

LANDSCAPE RECEPTORS		Susceptibility		
		High	Medium	Low
Value	National	High	High/Medium	Medium
	Regional	High/Medium	Medium	Medium/Low
	Community	Medium	Medium/Low	Low

Table 7.3 Visual Sensitivity

VISUAL RECEPTORS		Susceptibility		
		High	Medium	Low
Value	National	High	High/Medium	Medium
	Regional	High/Medium	Medium	Medium/Low
	Community	Medium	Medium/Low	Low

Magnitude

- 7.3.3 Scale of effect is the primary factor in determining magnitude; which may be higher if the effect is particularly widespread and/or long lasting, or lower if it is constrained in geographic extent and/or timescale. The table below illustrates how this judgement is considered as a two-step process.

Table 7.4 Magnitude Diagram

Scale / extent		Large	Medium	Small	Negligible
	Wide	Substantial			
	Intermediate		Moderate		
	Localised			Slight	
	Limited				Negligible

Stage 1 Result/ Duration		Substantial	Moderate	Slight	Negligible
	Permanent	Substantial			
	Long-term		Moderate		
	Medium-term			Slight	
	Short-term				Negligible

- 7.3.4 Where magnitude is judged to lie between levels, an intermediate assessment will be adopted.

Significance of Effects

- 7.3.5 The significance of any identified landscape or visual effect is assessed as major, moderate, minor or negligible. These categories are based on the consideration of sensitivity with the predicted magnitude of change. The table below is not used as a prescriptive tool and illustrates the typical outcomes, allowing for the exercise of professional judgement. In some instances a particular parameter may be considered as having a determining effect on the analysis.

Table 7.5 Significance

SIGNIFICANCE		Magnitude of Change			
		Substantial	Moderate	Slight	Negligible
Receptor Sensitivity	High	Major	Major/ Moderate	Moderate	Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor/ Negligible
	Low	Moderate	Moderate/ Minor	Minor	Negligible

- 7.3.6 Where the effect has been classified as Major or Major/Moderate this is considered to be equivalent to likely significant effects referred to in the EIA Regulations. The conclusion that some effects are 'significant' should not be taken to imply that they should warrant a refusal in any decision making process.

Beneficial/Adverse

- 7.3.7 Landscape and visual effects can be beneficial or adverse, and in some instances may be considered neutral. Neutral effects are those which overall are neither adverse nor positive but may incorporate a combination of both.
- 7.3.8 Taking a precautionary stance, changes to rural landscapes involving construction of man-made objects of a large scale are generally considered to be adverse.
- 7.3.9 With regards to the visual effects of wind farms, it is important to recognise the differing views revealed by extensive available research and to take into account that for the same development, some may view the impact as adverse, some as beneficial and yet others as neutral. This depends to some extent on the viewer's predisposition towards landscape change but also their opinions regarding climate change and the principle of renewable energy development including wind farms in the landscape. Taking a precautionary approach in making an assessment of the 'worst case scenario', the assessment considers that all effects on views which would result from the construction and operation of the proposed development to be adverse, unless specified otherwise in the text. It should be noted however that not all people would consider the effects to be adverse.

Cumulative Assessment

- 7.3.10 In line with the EIA regulations and SNH guidance Assessing the Cumulative Impact of Onshore Wind Energy Developments (2021) the assessment will consider other wind farms within the 30km search area including those which are operational, consented and those for which an application has been submitted but which are yet to be determined. Schemes in scoping are included by exception where there is specific justification for doing so - which in the case of this assessment includes Y Bryn (Cumulative Site ID 31) due to its proximity to the Site. Proposed developments at the scoping or screening stages are identified in Figure 3.1 and Appendix 3.4, and wind turbines are included in baseline panorama wirelines.
- 7.3.11 Operational and consented sites form part of the baseline and future baseline respectively for the assessment set out within sections 7.4-7.10. Unconsented proposals are considered as potential cumulative scenarios in section 7.11.

Night-time Assessment

- 7.3.12 The development proposals include aviation lighting for which an assessment of potential night-time impacts is included in section 7.7. The methodology for that assessment is included within the relevant section and the scope of the night-time assessment was agreed with consultees as set out within Table 7.1.

Residential Amenity

- 7.3.13 As set out within LI Technical Guidance Note 02/19 'Residential Visual Amenity Assessment (RVAA)':

"Changes in views and visual amenity are considered in the planning process. In respect of private views and visual amenity, it is widely known that, no one has 'a right to a view.' ...

It is not uncommon for significant adverse effects on views and visual amenity to be experienced by people at their place of residence as a result of introducing a new development into the landscape. In itself this does not necessarily cause particular planning concern. However, there are situations where the effect on the outlook / visual amenity of a residential property is so great that it is not generally considered to be in the public interest to permit such conditions to occur where they did not exist before."

- 7.3.14 A separate assessment of the effects on residential visual amenity has been undertaken in line with Landscape Institute Technical Guidance Note 2/19: Residential Visual Amenity Assessment (RVAA) and is provided within Appendix 7.5. The study area for the RVAA is 2km from the proposed turbines as agreed with NPTCBC (see Table 7.1).

Distances

- 7.3.15 Where distances are given in the assessment, these are approximate distances between the nearest turbine, and the nearest part of the receptor in question, unless explicitly stated otherwise.

Visual Aids

- 7.3.16 Photographs of the existing views, along with wirelines and photomontages showing the Proposed Development are included within Volume II. The method of visualisation selected has been informed by LI Technical Guidance Note 06/19 'Visual Representation of Development Proposals' and the Scottish Natural Heritage (SNH, now NatureScot) 'Visual Representation of Wind Farms – Guidance' (Feb 2017). The methodology of production for the visualisations is described in Appendix 7.2.

Assumptions and limitations

- 7.3.17 Whilst some assumptions 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 landscape and visual effects.

7.4 Baseline conditions

Introduction

- 7.4.1 An overview of the baseline study results is provided in this section with the full baseline description of the individual landscape and visual receptors being provided alongside the assessment in section 7.6 for ease of reference.
- 7.4.2 This section provides a review of the key local baseline studies and guidance documents and identifies those landscape and visual receptors which merit detailed consideration in the assessment of effects, and those which are not taken forward for further assessment as effects “have been judged unlikely to occur or so insignificant that it is not essential to consider them further” (GLVIA3, para. 3.19).
- 7.4.3 Both this baseline section and the effects section describe landscape character and visual receptors before considering designated areas as it is common for designations to encompass both character and visual considerations within their special qualities or purposes of designation.

Local Guidance and Baseline Studies

- 7.4.4 The following guidance documents provide advice relevant to this assessment:

ZTV Study

- 7.4.5 Zone of Theoretical Visibility (ZTV) studies were generated based on the proposed design. These are shown on Figures 7.2 and 7.6 and indicate areas of potential visibility for the turbines and solar array. Figure 7.5 provides a 'bare ground' analysis and only allows for the screening provided by topography. Figures 7.2 and 7.6 include both a topographic model and buildings and trees (with assumed heights as indicated) as visual barriers in order to provide a more realistic indication of potential visibility.
- 7.4.6 The ZTV studies were used to aid the identification of those receptors that are likely to be most affected by the proposed development and those that do not require detailed consideration. It should be noted that some areas shown as having potential visibility may have visibility of the development screened by non-mapped buildings or walls, taller woodland or individual trees and hedgerows, and some new views may have been opened up by demolitions or tree felling.
- 7.4.7 Figure 7.2 shows the likely pattern of visibility of the turbines would be as follows:
- Visibility within 5km is constrained by terrain and woodland. It extends across and slightly beyond open areas of the wind farms to the north and northeast; to the southeast across the site of the consented Foel Trawsnant wind farm; and to open areas of higher ground to the west and southwest - include areas east of Tonna; southeast of Cimla; and north of Aberdulais. Limited and patchy areas of visibility are indicated from roads and settlement within the valleys.
 - Visibility within 5-10km is limited in most directions, with the main areas lying to the west and northwest on the southeast facing slopes of Mynydd Marchywel and more elevated areas at the western edges of Neath and at Mynydd Drumau. A distinct area of visibility is also indicated between Croeserw and the existing and consented wind farms at Llynfi Afan and Upper Ogmere.
 - Visibility within 10-15km is patchy and tends to be most commonly of less than all six turbines. The main areas of visibility arise near Mynydd Baedan and Mynydd-ty-Talwyn near Bridgend; in coastal and lower-lying areas near Swansea - including the docks,

University and Crymlyn Bog; in areas of settlement within Swansea which are located on higher ground, and from east facing slopes beyond Pontardawe and Clydach.

- Visibility beyond 15km arises in areas of settlement within Swansea which are located on higher ground; from the coast between Swansea and Mumbles Head; from hill tops and east facing slopes north of the M4 extending to the wind farms at Mynydd y Gwair and Mynydd y Bettws; and from within the Bannau Brycheiniog National Park including extensive visibility from the south facing slopes of the Black Mountains and more patchy visibility from open areas of higher ground near Ystradfellte.

7.4.8 Figure 7.6 shows the likely pattern of visibility of the solar array would be as follows:

- Visibility within 2.5km would arise across the site and from open areas of higher ground to the west and south of Tonmawr. An area of visibility would also arise near the Mountain Centre / Afan Bike park and potentially from the southern edge of Tonmawr (near viewpoint 7).
- Visibility within 2.5-5km would arise from open slopes facing towards the site at Moel y Fen and south of the B4287 and from more distant open hillsides to the northwest.
- Where the solar farm is visible, the turbines will also be seen and will be the more noticeable change to the view, with the solar farm forming a minor element (as illustrated by the photomontages for viewpoints 2 and 7). Where relevant, views of the panels are noted within the assessment.

7.4.9 Effects on landscape or visual receptors outside the areas of visibility shown on the ZTV studies would be Negligible and are not assessed in detail.

Landscape Character

7.4.10 The Site lies within National Landscape Character Area (NCLA) 37: South Wales Valleys. The area is broadly described as a 'landscape of contrasts' containing extensive upland plateaux, dissected by steep-sided urbanised valleys. The Site is also located within area 17 Feol Fynyddau within the NPT character assessment, with area 11 Cwm Afan and Cwm Pelenna nearby to the west.

7.4.11 The LANDMAP and local character assessments note the mix of exposed upland moorland, forestry and wind farms and with limited present-day settlement or access despite a prior history of settlement and exploitation. The five LANDMAP layers identify the Site as being mostly of 'Moderate' value, but 'High' for the cultural aspect and 'Outstanding' for the Historic aspect due to the past presence of heavy industry in the surrounding area, particularly of mineral extraction and processing. Such industrial sites now lie dormant with many reclaimed and re-integrated into the landscape.

7.4.12 Given the varied information sources available, the local landscape character assessments are used to identify receptors (i.e. character areas). The national landscape character assessment is used in those areas where there is no local coverage.

- The 2004 Neath Port Talbot LANDMAP Landscape Assessment areas are treated as the landscape character receptors, supplemented with information from the more up-to-date 2014 national assessment, and site observations as needed. Sensitivity judgements are informed by LANDMAP and the 2018 NPT landscape and seascape SPG.
- The Bridgend County Borough Landscape Character Assessment (2013) and Bridgend SPG 20: Renewables in the Landscape (2014) are referred to in relation to landscape character and sensitivity in this area.
- Areas of visibility within Powys and outside the National Park are indicated by the ZTV study (see Figure 7.2) to be limited and more than 10km from the turbines. Given the existing development context and limited visibility, significant effects would not be

expected and effects on landscape character within Powys are scoped out of assessment.

- Areas of visibility within Rhondda Cynon Taf are limited to a very small area approximately 9km to the southeast, and a broader area more than 17km to the northeast of the site. Given the existing development context and the limited visibility, significant effects would not be expected and effects on landscape character within Rhondda Cynon Taf are scoped out of assessment.
- The Bannau Brycheiniog National Park Authority's Landscape Character Assessment (2012) has been used to identify the landscape character receptors, supplemented with information from the more up-to-date 2014 national assessment, and site observations as needed. Sensitivity judgements are informed by LANDMAP.

7.4.13 A LANDMAP assessment based on the advice contained within Guidance Note 046 is provided in Appendix 7.6. The information generated by that analysis is used to identify areas which require detailed assessment as set out below and to inform judgements of sensitivity.

7.4.14 Table 7.6 provides a review of landscape character areas as shown on Figure 7.1 within the 15km detailed study area and areas of visibility within the Bannau Brycheiniog National Park. The analysis identifies whether the character areas require further assessment using the following criteria:

- Whether the LANDMAP analysis provided within Appendix 7.6 identifies one or more aspect areas within the geographic extent of the character area as requiring consideration;
- Whether there is more than limited theoretical visibility from within the character area; and
- Whether existing or consented wind farms nearby, or between the character area and the Site, would mean that any additional effects arising from the Proposed Development would be expected to be negligible (in which case the area does not require further consideration).

7.4.15 In each case a 'Y' indicates that the character area requires further consideration based on that criterion.

Table 7.6 Review of landscape character areas for further assessment

LCA	LANDMAP	Visibility	Existing and consented wind farms
Neath Port Talbot			
1: Margam Marsh			
2: Margam Burrows	Y		Y
3: Margam Country Park		Y	
4: Coedhirwaun		Y	
5: Coedhirwaun Scarp and open scarp tops	Y		Y
6: Mynydd Brombil, Mynydd Emroch & Mynydd Dinas	Y		Y
7: Mynydd Margam	Y		Y
8: Goytre Valley	Y		Y
9: Cefn Cethin		Y	Y
10: Mynydd Bychan	Y	Y	Y
11: Cwm Afan and Cwm Pelenna	Y	Y	Y
12: Mynydd Penhydd	Y		Y
13: Foel Trawsnant	Y		Y
14: Foel Fawr	Y		Y
15: Mynydd y Gelli	Y		Y

LCA	LANDMAP	Visibility	Existing and consented wind farms
16: Briton Ferry Woods	Y		Y
17: Feol Fynyddau	Y	Y	Y
18: Mynydd Resolfen, Craig-y-Llyn & Mynydd Ynyscorrwg	Y	Y	Y
19: Neath Valley	Y		Y
20: Gnoil Park	Y		Y
21: Hirfynydd	Y		Y
22: Banwen Pyrddin	Y		Y
23: Head of Dulais Valley	Y		Y
24: Dulais Valley	Y	Y	Y
25: Mynydd Marchywel	Y		Y
26: Swansea valley	Y		Y
27: Mynydd Allt y grub		Y	
28: Slopes of Cefn Gwrhyd & Cwm Egel	Y		Y
29: Mynydd Uchaf, Mynydd Garth & Cefn Gwrhyd	Y		Y
32: Cwm Gors, Gwaun Cae Gurwen & Abernant			Y
33: Cwm Twrch		Y	Y
35: Bryn Mawr, Mynydd Carnllechart, Mynydd y Baran & Mynydd Gellionnen	Y	Y	Y
36: Upper Clydach River valley & Lower slopes of Mynydd Gellionnen	Y	Y	Y
37: Pontardawe, Rhos, Alltwen & Trebanos		Y	Y
38: Mynydd Drumau	Y	Y	Y
39: Clydach valley, Cilybebyll & Cilffrew	Y	Y	Y
40: Neath	Y	Y	Y
41: Neath Estuary	Y	Y	Y
42: Former Llandarcy Refinery		Y	
43: Jersey Marine	Y	Y	Y
44: Earlswood	Y	Y	Y
45: Crymlyn Bog		Y	Y
46: Ca'er Hendy		Y	
47: Elba Crescent		Y	
48: Baglan Bay works	Y	Y	
49: Port Talbot, Sandfields, Baglan & Margam	Y		Y
50: Port Talbot Docks & Margam works	Y		Y
51: Cwmafan	Y		Y
52: Margam Sands / Aberavon Sands	Y		Y
53: Neath Estuary Mouth	Y	Y	Y
Bridgend			
1: Llangynwyd Rolling Uplands and Forestry	Y		Y
2: Llynfi Valley Floor and Lower Slopes	Y		Y
3: Llynfi & Garw Uplands and Forestry	Y		Y
4: Bettws Settled Farmland			
5: Garw Valley Floor and Lower Slopes	Y		Y
6: Mynydd Llangeinwyr Uplands	Y		Y
7: Ogmore Valley Floor & Lower Slopes			
8: Ogmore Forest and Surrounding Uplands	Y		Y
14: Kenfig Dunes and Coastline			Y
15: Cefn Cribwr Ridge and Settled Farmland	Y		Y
Swansea			

LCA	LANDMAP	Visibility	Existing and consented wind farms
NCA 37 South Wales Valleys	Y	Y	Y
NCA 38 Swansea Bay		Y	Y
Bannau Brycheiniog			
2: Y Mynydd Du	Y	Y	Y
3: Fforest Fawr	Y	Y	
4: Waterfall Country and Southern Valleys	Y	Y	
7: Central Beacons	Y	Y	

7.4.16 Character areas with a 'Y' entered for all 3 criteria (identified in bold text) in Table 7.6 above are considered further in section 7.6. Effects for other areas are judged to be likely to be negligible and are not considered further.

Visual Receptors

7.4.17 Visual receptors are “the different groups of people who may experience views of the development” (GLVIA, 3rd edition, para 6.3). In order to identify those groups who may be significantly affected the ZTV study, baseline desk study and site visits have been used.

7.4.18 The different types of groups assessed within this report encompass local residents; people using key routes such as roads; cycleways, people within accessible or recreational landscapes; people using Public Rights of Way (PRoW); or people visiting key viewpoints. In dealing with areas of settlement, PRoW and local roads, receptors are grouped into areas where effects might be expected to be broadly similar, or areas which share particular factors in common.

7.4.19 Representative viewpoints have been selected to aid the assessment of effects on visual receptors.

Baseline Visual Environment

7.4.20 As shown in Figure 1.1 the site is in a relatively sparsely settled area of open moorland and forested upland adjacent to Pen y Cymoedd wind farm. Views from the open uplands tend to be expansive, whilst those from roads and settlements within the valleys are contained by the valley sides.

Visual Receptor Groups

7.4.21 The following visual receptor groups are located within the study area and are likely to have visibility of the Proposed Development, as shown on Figure 7.4 and are considered further in section 7.6. Where settlements are named the relevant visual receptors group are residents of and visitors to that settlement.

- Users of PRoW and access land across the Site and within 2km (includes Site);
- Tonmawr (1.0km, southwest);
- Visitors to South Wales Miners Museum and users of nearby routes and access land (2.3km, southeast)
- Local road, PRoW and access land users south and southeast of Cimla (3km, southwest);
- Cymmer and Croeserw (3.2km, east);

- Visitors to Wildfox Resort (2km, southeast);
- Cilfrew, Mynydd Marchywel and Sarn Helen (3.5km, northwest);
- Caerau and users of footpaths and access land at Mynydd Pwll-yr-lwrch (4.5km, southeast);
- Neath (5km, west);
- Local road and PRow users near Mynydd-ty-Talwyn and Mynydd Baedan (10km, southeast);
- Local road and PRow users west of Clydach and Pontardawe (11km, northwest);
- Local residents, road, access land and PRow users and visitors to the National Park near Ystradfellte (14km, northeast);
- Recreational visitors to the south facing slopes of the Black Mountains (15km, north); and
- Swansea (15km, southwest).

Key routes

- 7.4.22 A number of key road and rail routes pass through the study area, but as indicated by Figure 7.4, none of these are likely to have more than limited and distant views of the Proposed Development. Effects on these routes are judged to be negligible and are not considered further.
- 7.4.23 Long distance recreational routes within the study area which are indicated to have more than very limited potential visibility of the Proposed Development are considered further in section 7.6, and include:
- Celtic Way (passes through the site);
 - Cistercian Way (0.7km, west);
 - National Cycle Route (NCR) 47 (1.5km, north);
 - St Iltyd's Walk (2km, north);
 - Ogwr Ridgeway Walk (9.5km, south);
 - Coast to Coast path (14km, northwest).
- 7.4.24 Other long distance footpaths and cycle routes (Wales Coast Path, Coed Morgannwg Way, all national cycle routes except NCR 47) would have very limited and/or distant views and effects are judged to be negligible and are not considered further.

Specific Viewpoints

- 7.4.25 No specific 'visitor destination' viewpoints have been identified as requiring individual detailed consideration. There are a number of panoramic viewpoints identified on Ordnance Survey maps, and the Stargazing Hare near Crynant within the study area, but none of these locations would have visibility of the Proposed Development as indicated by Figure 7.2.

Landscape Designations and Value

Designated areas

- 7.4.26 National landscape designations within the study area and with theoretical visibility of the Proposed Development as indicated by Figure 7.5 are considered further in section 7.6 and include:

- Bannau Brycheiniog National Park (14km, north); and
- The Gower Peninsula AONB (20km, southwest).

7.4.27 There are also a number of Registered Historic Parks and Gardens within the study area however none of these, with the exception of Singleton Park Botanic Gardens, are identified as having visibility of the Proposed Development. Given the tree cover within Singleton Park and the surrounding context it is considered that effects on all Registered Historic Parks and Gardens would be negligible and these are not considered further.

7.4.28 Local development plans identify Special Landscape Areas (SLAs) as shown on Figure 7.2. Some of these are host to existing and consented wind farms and the areas of theoretical visibility for the Proposed Development tend to coincide with these areas of higher open ground; or there are wind farms located between the SLA and the Site. Those with more than limited theoretical visibility of the Proposed Development in areas not hosting, or affected by intervening existing or consented wind farms are considered further in section 7.6, and include:

- Vale of Neath (1.5km, north);
- Dulais Valley (3km, northwest);
- Mynydd y Garth (10.5km, northwest); and
- Mawr Uplands (11.8km, northwest).

7.4.29 Other SLAs identified in these documents are considered more distant and/or would have limited visibility, and/or are affected by existing and consented wind farms such that additional effects would not arise from the Proposed Development. Effects those SLAs would be negligible and they are not considered further.

7.5 Inherent Design Mitigation

7.5.1 The design approach is described in full within Chapter 4. In relation to landscape and visual matters, the design has focussed on optimising the balance between maximising energy generation and avoiding excessive "*adverse visual impacts on nearby communities and individual dwellings*" and on ensuring that landscape and visual effects arising from the solar panels and other site infrastructure have been mitigated through maximising the use of screening by the site topography and forestry proposals (as set out within Future Wales policy 18).

7.5.2 In relation to the Proposed Development this has focused specifically on the following:

- The scale composition of the turbines with adjacent wind farms - in particular in views from the west and east where the wind farms will be seen alongside each other;
- Potential visual effects on Tonmawr;
- Effects on the closest non-involved property at Pelenna.

7.5.3 Balancing these considerations, the resultant design is set back from the edge of the terrain at the east of Mynydd Blaenafon in order to maximise the screening effects of terrain in views from Pelenna. Consideration of views from Tonmawr has resulted in graded heights, with lower tip height turbines closest to the village. Since the consultation ES was published, the previously proposed seventh turbine which was closest to Tonmawr has been omitted and the solar panel area has been slightly adjusted.

7.5.4 The taller turbines would be closest to the existing wind farm and least visible from surrounding nearby settled areas. Apart from viewpoints 1 and 2 which are closest open upland views outside of the site and which allow a perspective across the wind farms such

that the relative positions of turbine bases can be seen, the varied scale of the turbines compared to the existing wind farms would not be readily apparent.

7.6 Potential Effects

Introduction

- 7.6.1 This section sets out the effects that the Proposed Development would have on landscape and visual receptors.
- 7.6.2 Effects during construction, decommissioning and for the completed development are considered for each landscape and visual receptor. The effects during construction and decommissioning would arise for a 12 month (short-term) period from a noticeable presence of vehicles and plant on-site during groundworks and the use of cranes to erect/dismantle the turbines. Once standing turbines are on-site, the most notable effects would arise from these and effects during the construction and decommissioning stages are assessed to be the same as during operation except where otherwise specifically noted in the assessment below.
- 7.6.3 The duration of the operation of the Proposed Development is 35 years, and effects are assessed to be reversible and to arise for a period of time between Long-term and Permanent (as defined in Appendix 7.1) except where otherwise specifically noted in the assessment below.

Grid Connection

- 7.6.4 As shown in Figure 4.14, the grid connection would run from the onsite switchgear building (which will be in one of two potential locations as shown on Figure 4.1, to an existing substation near Briton Ferry. This grid connection will form part of a separate application for which a broad route corridor has been identified, which is expected to use a mix of underground cables and wooden poles).
- 7.6.5 Receptors within and close to the grid corridor that may be affected by these changes include:
- LCA 11 Cwm Afan and Cwm Pelenna
 - LCA 16: Briton Ferry Woods;
 - LCA 17: Feol Ffynyddau;
 - LCA 18: Mynydd Resolfen, Craig-y-Llyn & Mynydd Ynyscorrwg;
 - Tonmawr
 - Residents of the edges of Baglan, Cimla and Briton Ferry;
 - Local roads, public rights of way and residents living in rural properties between Tonmawr and Baglan, Cimla and Briton Ferry; and
 - Jersey Park Historic Park and Garden.
- 7.6.6 The area close to the substations at Baglan and Briton Ferry already has some overhead lines which radiate out through Briton Ferry Woods and Tonmawr is already notably affected by both a nearby pylon route and telephone lines.
- 7.6.7 Some landscape and visual effects would be likely to arise, with effects for any underground sections arising from construction activity and potentially some limited removal and reinstatement of hedgerows. Effects from overhead lines would include some very localised changes to character and views.

- 7.6.8 It is considered that with good design by way of detailed route selection and the use of undergrounding through particularly sensitive sections, the effects of the grid connection would be highly localised.
- 7.6.9 Given the lack of certainty over its precise routing and nature, the grid connection is not considered further within this assessment.

Effects on Site Fabric

- 7.6.10 The main effects of site fabric would be the formation of tracks, turbine foundations and crane hardstandings, and the construction of the switchgear building and solar panels. No tree or hedgerow removals are required on-site to accommodate the turbines, but some limited removals will be required to form the site access from Fforch-dwm Road. The implementation of the proposals would also mean that not all of the area of approved forestry would be planted, as some areas would be required to be kept clear around the base of the turbines.

Viewpoint Analysis

- 7.6.11 Viewpoint analysis has been undertaken from a total of 19 viewpoints. The final list of viewpoints was agreed through the scoping process as set out within Table 7.1.
- 7.6.12 The viewpoint locations are illustrated with reference to viewpoints 1 to 19. The visualisations (comprising photographs of the existing view, wireframes and photomontages) are provided for viewpoint 1-15, 17 and 19.
- 7.6.13 Viewpoint 18 only has wireframes provided (as agreed during scoping) as the selected location is a main road route with no footways and so photography could not be safely undertaken.
- 7.6.14 Viewpoint 16 is illustrated from two locations - 16 and 16a. Location 16 is illustrated with photograph, cumulative wirelines, wireline and photowire; as the turbines are largely screened but the location was selected as representative of the closest views from the village and has potential cumulative visibility with Y Bryn wind farm. 16a is illustrated by a photomontage as it is very nearby but has more open views of the Proposed Development but no visibility of Y Bryn. These two views are considered together as a single viewpoint with judgements reflecting the 'worst case' of the more open views towards the Proposed Development (at 16a).
- 7.6.15 The full viewpoint analysis is contained within Appendix 7.4: Viewpoint Analysis. The findings are summarised below in Table 7.7: Viewpoint Analysis Summary. In each case, distances are listed in relation to the nearest turbine (rather than the solar panels).
- 7.6.16 Appendix 7.4: Viewpoint Analysis describes changes to character and views at each viewpoint location only. The sensitivity of receptors and wider extent of the effect (beyond the individual viewpoint) and its duration are considered in the main body of the assessment text below as part of the consideration of the magnitude and significance of effects.

Table 7.7 Viewpoint analysis summary

Viewpoint Number	Viewpoint	Distance /Direction	Scale of Landscape Effect	Scale of Visual Effect
1	St Illtyd's Walk near Carn Caca	2.4km, N	Small	Large/medium
2	SLA 3, east of Tonna	1.7km, W	Medium	Large
3	SLA 6, By-way above Cynonville	2.4km, S	Negligible	Small
4	Afan Bike Park	2.1km, S	Large/medium	Large
5	SLA 2/3, Sarn Helen	4.9km, N	Small	Medium/small
6	Heol-Y-Fedw, Croeserw	4.3km, SE	Negligible	Negligible
7	Tonmawr Road, Tonmawr	2.0km, SW	Large/medium	Large
8	Cilfrew	4.5km, NW	Small	Medium/small
9	Bridleway near Cimla Equestrian Centre	3.6km, SW	Medium	Large/medium
10	Heol Penlan, Neath Abbey	7.2km, W	Negligible	Small
11	Beach Path, Swansea University Bay Campus	11.4km, SW	Negligible	Small/negligible
12	SLA 1, Cwn Clydach Walk outside Pontardawe	12.2km, NW	Negligible	Small/negligible
13	National Park, Comin y Rhos	15.0km, NE	Negligible	Negligible
14	National Park, above Ystalfera	16.9km, N	Negligible	Negligible
15	AONB, Mumbles Head	20.7km, SW	Negligible	Negligible
16	John's Terrace, Tonmawr	1.2km, SW	Large/medium	Large
17	Cimla Common	4.7km, SW	Negligible	Negligible
18	A474 flyover, Neath	5.8km, W	Negligible	Negligible
19	Pleasant View, Caerau	4.7km, SE	Negligible	Small (winter)

7.6.17 Each of the viewpoints is a 'sample' of the potential effects, representing a wide range of receptors – including not only those actually at the viewpoint, but also those nearby, at a similar distance and/or direction. From these viewpoints it can be seen that the distribution of effects would be as follows:

7.6.18 Effects on character:

- There would be no Large scale effects due to the presence of the existing wind farms. Large/medium scale effects would arise within the site and up to 2km to the south, southwest and west of the Proposed Development.
- Medium and Medium/small scale effects would arise a result of the noticeable scale contrasts with the existing wind farms in areas within 2.5km to the west; and as a result of turbines becoming a key feature of the locality in areas where they currently have limited influence in areas up to 5km to the southwest.

- Small scale effects as a result of visible but relatively distant turbines would arise up to 10km west and southwest, and 7km southeast. Small scale effects would also arise up to 5km northwest as a result of minor scale contrasts with the existing turbines resulting in a slightly greater influence of turbines on the landscape in this area.
- Beyond this distance effects would reduce to Negligible.

7.6.19 Effects on views:

- Large and Large/medium scale effects would arise up to 2.5km to the north and west and 5km to the south and southwest as a result of close views of the turbines and other site infrastructure.
- Medium/small scale effects would arise on views from the northwest at approximately 4-6km where the turbines would be seen to enlarge and extend the existing wind farms.
- Small scale effects would arise within up to 10km west and 7km southeast.
- Beyond this distance effects would reduce to Negligible with some Small/negligible effects extending to approximately 12km to the west and southwest.

Effects on Landscape Character

7.6.20 Descriptions for each of the assessed character areas/types are briefly summarised below, along with further observations from site based work.

7.6.21 Based on the assessments of the scale of effects at viewpoints as set out at in Table 7.7 and section 7.6.18 above, some of the character areas identified for detailed assessment in Table 7.6 would experience negligible effects and do not require detailed assessment, as follows:

- 24: Dulais Valley (3.2km, northwest) - Effects on character at nearby viewpoint 8 would be Small scale, but this judgement relates specifically to the relationship between the village and the views to the east. From the valley landscape character area most of the views of the turbines would be from the more distant open upper valley sides to the north of viewpoint 8 where open views of the existing wind farms are more prevalent and effects would tend to be of Negligible scale and magnitude.
- 39: Clydach valley, Cilybebyll & Cilffrew (4.1km, northwest) - Effects on character at nearby viewpoint 8 would be Small scale, but this judgement relates specifically to the relationship between the village and the views to the east. Effects in the Limited extent of patchy visibility to the south of viewpoint 8 are likely to vary between Small/negligible and Negligible scale (based on viewpoint 10 to the south) and be of Negligible magnitude.
- 35 Bryn Mawr, Mynydd Carnllechart, Mynydd y Baran & Mynydd Gellionnen (11.7km, northwest) and 36 Upper Clydach River valley & Lower slopes of Mynydd Gellionnen (10.7km, northwest) - As indicated by viewpoint 12, effects on these areas would be of Negligible scale and magnitude.
- 38 Mynydd Drumau (7.2km, west) - As indicated by viewpoints 10 and 12 which are located at similar distances and directions to this character area, effects on this area would be of Negligible scale and magnitude.
- 40 Neath (3.1km, west), 41 Neath Estuary (5.5km, west), 43 Jersey Marine (8.8km, southwest), 44 Earlswood (8.2km southwest) and 53 Neath Estuary Mouth (9.5km, southwest) - As indicated by viewpoints 10, 11 17 and 18, effects on these areas would be of Negligible scale and magnitude.

18: Mynydd Resolfen, Craig-y-Llyn & Mynydd Ynyscorrwg (includes Site)

- 7.6.22 As shown on Figure 7.1, this character area includes part of the Site where four turbines would be located and extends across the forested upland areas to the northeast. Key characteristics are identified within the Neath Port Talbot LANDMAP Landscape Assessment as:

"Expansive upland plateau separating the Afan and Neath Valleys, rising to 600m AOD.

Extensive coniferous woodland cover, which acts as distinct element in the adjacent valleys.

Large areas of open moorland and grazed upland.

Evidence of human history from prehistory to the Industrial Revolution.

Extensive geological SSSI designations contained primarily to the north.

Sustrans National Cycle Network passes through this upland."

- 7.6.23 As identified within Appendix 7.3, the susceptibility of this character area/type is judged to be Medium/low given its large scale simple land uses and patterns, and open upland character . As described within Appendix 7.3, the landscape within this character area/type is judged to be of Community value; it is not designated but includes some important recreational routes and facilities including long distance footpaths and Afan Bike Park, it also has a notable time depth. Considering susceptibility and value together the sensitivity is judged to be Medium/Low. The current association of this landscape type with wind farms and its inclusion within a Pre-assessed Area (and previously within a Strategic Search Area) reflect this relatively low degree of sensitivity.

- 7.6.24 As described within Appendix 7.4 Viewpoint Analysis, viewpoints 1 and 4 are within this character area and reflect the pattern of visibility being restricted by forestry. This pattern will vary depending on the felling cycle. The open areas within which the turbines and site infrastructure would be sited would experience Large/medium scale effects as a result of the change from open upland to a wind farm. A restricted area of Small scale effects would also arise within the open area around viewpoint 1, as a result of the noticeable increase in scale of the turbines from the current wind farms. Considered together, these effects would result in the remaining areas of open land in the character area (an Intermediate extent) being markedly affected by wind farm and would result in a Substantial/moderate magnitude of change. Effects would be of Moderate, Adverse significance (not significant).

11: Cwm Afan and Cwm Pelenna (includes Site)

- 7.6.25 As shown on Figure 7.1, this character area includes part of the site at Mynydd Blaenafon where two of the turbines, the solar array and the site access would be located. The area extends southwards along the valley to the coast and around the base of the adjacent upland area to the east. Key characteristics are identified within the Neath Port Talbot LANDMAP Landscape Assessment as:

"Deeply incised valleys with sinuous alignment.

Valley bottom has been significantly modified by past mining activities.

Mosaic landscape throughout, the valley bottom contains substantial deciduous tree cover.

Settlements and features, such as viaduct and aqueduct, relating to past industrial influences.

Substantial recreational use within the valley, especially Afan Forest Park.

Mosaic of habitats, river valley systems dominating valley floor, higher ground significant fridd habitat."

- 7.6.26 As identified within Appendix 7.3, the susceptibility of this character area/type is judged to be High/medium given its small scale contained nature and diversity of land uses. As described within Appendix 7.3, the landscape within this character area/type is judged to be of Community value; it is not designated but reflects local industrial history and provides recreational opportunities. Considering susceptibility and value together the sensitivity is judged to be Medium. As noted within Appendix 7.3, Mynydd Blaenafon shares more in common with the adjacent character area 18 and this is reflected in some of the LANDMAP layers which separate it from the rest of the valley, though the proposed broadleaf woodland on the lower slopes of Mynydd Blaenafon would create a more transitional character between the valley landscape and the hill top. This variability of sensitivity is also reflected in national policy via inclusion of this area in Pre-assessed area 9 for large scale wind farms.
- 7.6.27 As described at within Appendix 7.4 Viewpoint Analysis, viewpoints 3,6 and 7 are within this character area and reflect the pattern of visibility being channelled by the valleys such that views of the Proposed Development would arise either looking towards the heads of valleys or from the upper sides of valleys facing towards the Site. The greatest effects would be within the Site due to the change to become a wind (and solar) farm and the areas of visibility in and around Tonmawr and Efail-fach where the Localised effects would be Large/medium scale. The areas of visibility from the upper valley sides near Cynonville, and near Croeserw (as shown by Figure 7.2) would give rise to Negligible scale effects due to more limited visibility and the influence of existing and consented wind farms in these areas. There would be a Moderate magnitude of change to the character and effects would be of Major/moderate, Adverse significance (significant).

17: Foel Fynyddau (0.8km, west)

- 7.6.28 As shown on Figure 7.1, this character area of open hilltops extends southwards from near Tonna, becoming broader towards Neath, Baglan and Cwmafan. Key characteristics are identified within the Neath Port Talbot LANDMAP Landscape Assessment as:

"The mass of Foel Fynyddau, topped with communication masts, is the dominant landform.

Fields are enclosed by numerous field boundary types across the area.

The landscape contains two distinct areas of coniferous plantation, within a predominantly fridd landscape.

Individual dwellings are scattered through the area, predominantly on the lower elevations.

Connects the Afan and Neath valleys, straddling the ridge at its lowest point.

The riparian corridors, significantly lined with deciduous trees.

The settled character evident on lower ground gradually dissipates on high ground.

Bronze Age cairns and Iron age hillforts present represent historically, a highly organised landscape."

- 7.6.29 As identified within Appendix 7.3, the susceptibility of this character area/type is judged to be Medium given its mixed scale, patterns and openness with open hilltops, notable infrastructure of masts and pylons, and more rural enclosed lower slopes. As described within

Appendix 7.3, the landscape within this character area/type is judged to be of Community value; it is not designated except for a small area within the SLA near Tonna, but has time depth and provides recreational opportunities and a diversity of habitats within the ffridd landscape. Considering susceptibility and value together the sensitivity is judged to be Medium/low.

- 7.6.30 As described within Appendix 7.4 Viewpoint Analysis, viewpoints 2 and 9 are within this character area. These two viewpoints represent the two main areas of visibility as shown by Figure 7.2, with viewpoint 2 situated in the open upland near Tonna and viewpoint 9 located in the lower lying area near the base of Foel Fynddau. Effects within both of these areas would be Medium scale, affecting an Intermediate extent of the character area. There would be a Moderate magnitude of change to the character and effects would be of Moderate/minor, Adverse significance (not significant).

10: Mynydd Bychan (3.6km, south)

- 7.6.31 As shown on Figure 7.1, this character area is a small upland area to the south of the site. It is a medium scale pastoral landscape with an area of forestry towards the southern end. It is a similar landscape type to LCA 17, is likewise partly within an SLA (to the south of Cwmafan), and is judged to have the same Medium/low sensitivity.
- 7.6.32 Views of the Proposed Development would be restricted to areas of higher ground within the area where the turbines would be seen above intervening higher ground and forestry. Effects are judged to be of at most Small scale (based on viewpoints at similar distances) and would arise across a Localised extent resulting in a Slight magnitude of change. Impacts would be Moderate/minor and Adverse (not significant).

Visual Effects

- 7.6.33 Based on the assessments of the scale of effects at viewpoints as set out in Table 7.7 and at 7.6.19 above, some of the visual receptors identified in sections 7.4.21 and 7.4.23 would experience negligible effects and do not require detailed assessment:

- Cymmer and Croeserw (3.2km, east) - As illustrated by viewpoint 6, the Proposed Development would be seen amongst the existing turbines where visible and would appear of similar scale such that the addition is not readily noticeable and effects would be of Negligible scale.
- Local road and PRow users near Mynydd-ty-Talwyn and Mynydd Baedan (10km, southeast) and users of the Ogwr Ridgeway walk - Given the limited visibility at less than 12km, the assessment of effects for other viewpoints at 12-14km distance and the consented turbine at Foel Trawsant which would be seen between these visual receptors and the Proposed Development; effects would be of Negligible scale.
- Local road and PRow users west of Clydach and Pontardawe (11km, northwest) - As illustrated by viewpoint 12, effects in this area would be of Negligible scale.
- Local residents, road and PRow users and visitors to the National Park near Ystradfellte (14km, northeast) - As illustrated by viewpoint 13, the turbines would be partially visible in the distance beyond existing and consented turbines at Pen y Cymoedd, Melin Court and Ffynon Oer. In this context they would be a barely discernible addition to the current and future baseline and effects would be of negligible scale.
- Recreational visitors to the south facing slopes of the Black Mountains (15km, north) - As illustrated by viewpoint 14, the turbines would form a continuation of the existing distant groups along the skyline and would be partly screened by forestry and of a similar scale to the Maesgwyn group of turbines and the pylons also seen in the view. In this context, the effects would be of negligible scale.

- Swansea (15km, southwest) - As illustrated by viewpoint 11, the most open views from Swansea would be from the coast, where effects would be of Small/negligible scale. Effects within the remainder of the settlement would typically arise within more distant views from elevated western parts of the settlement as illustrated by Figure 7.2 and will tend to be of Negligible scale.
- Coast to Coast path (14km, northwest) - As illustrated by Figure 7.4 there would be short stretches of visibility from open areas of higher ground at distances of 14-16km from the Proposed Development. Effects in the areas of visibility indicated would be of Negligible scale as illustrated by the closest viewpoints (12 and 14).

Visual Receptor Groups

7.6.34 This assessment focuses on effects on groups of visual receptors, incorporating effects on views from public spaces and streets within neighbourhoods. The assessment of effects focuses on the visual amenity of public spaces, though views from groups of dwellings are also noted in the descriptions. Effects on private residential amenity are a separate matter and are assessed within Appendix 7.5.

7.6.35 All receptors described below have a High susceptibility to changes in views and views are of Community value except from within SLAs where they are of Regional value. In both cases the sensitivity of receptors is judged to be High\medium.

Users of PRow and access land across the Site and within 2km (includes Site)

7.6.36 Access routes in this area include a network of footpaths, bridleways and cycle routes variously located within woodland, open upland areas and around Tonmawr. There are also areas of open access land to the northeast of the site. As illustrated by Figure 7.4, visibility is restricted across much of this area by forestry, woodland and terrain, such that walkers would experience short stretches of visibility between enclosed stretches, or no visibility depending on the route followed.

7.6.37 Visual effects are represented by viewpoints 1, 2, 4 and 7 and illustrate that effects would typically be Large scale where the turbines are visible from areas to the south and west, reducing slightly to the northwest and becoming Negligible from the northeast where routes cross existing wind farms. Some locations (e.g. viewpoints 1 and 2) will also have views of other site infrastructure including tracks, solar panels and the proposed switchgear building (if sited at Mynydd Blaenafon). Proposed forestry and woodland will also become increasingly visible as it matures.

7.6.38 Large scale effects would arise for Localised extent of the routes, resulting in a Substantial/moderate magnitude of change. Effects would be Major/moderate significance and Adverse (significant).

Tonmawr (1.0km, southwest)

7.6.39 The settlement of Tonmawr is located within the valley to the south of Mynydd Blaenafon. There are two distinct parts of the settlement, with a lower lying area to the south of Pelenna River along Tonmawr Road (represented by viewpoint 7) and a second area focussed on Johns Terrace (represented by viewpoints 16/16a) wrapping around the lower slopes of Mynydd Blaenafon. The closest parts of the settlement to the site would have the most limited views, with vegetation and rising ground largely screening views from the track and open space to the east of Johns Terrace (as shown by viewpoint 16), and from Railway Terrace.

7.6.40 Views increase descending the hill towards Johns Terrace, where there would be an open view of the closest turbine from the northern end of the road (viewpoint 16a) resulting in Large scale effects. From the rest of Johns Terrace and from Maes-Gwyn, there would be more limited visibility due to localised screening by nearby houses and trees, but with some glimpsed views through gaps or through trees in winter likely to give rise to Large scale effects. The most open views of the Proposed Development would arise in aligned views along Tonmawr Road (see Viewpoint 7), where the access track and some of the solar panels would also be seen and effects would also be Large scale. Similar views, albeit more contained by housing would arise looking across the ends of the four culs-de-sac at Dan-y-Coed. In time, maturing woodland will cover parts of the open slopes but this will not provide notable screening.

7.6.41 Large scale effects would arise for an Intermediate extent of the village, resulting in a Substantial magnitude of change. Effects would be Major significance and Adverse (significant).

Visitors to South Wales Miners Museum and users of nearby routes and access land (2.3km, southeast)

7.6.42 The Miners Museum is located near Cynonville and a number of public rights of way run across the valley sides and lower slopes of Foel Trawsant to the east of the museum. As illustrated by Figure 7.4, the museum itself and the roads and settlements in the valley bottom would have visibility of the Proposed Development screened by terrain and forestry. Ascending the slopes slightly towards viewpoint 3, the turbines would start to become visible beyond Pen Y Cymoedd turbines, resulting in Small scale effects. Moving further up the slopes including within the open access land, walkers would be very close to (or within) the consented Foel Trawsant wind farm and effects from the Proposed Development would be Negligible.

7.6.43 Small scale effects of Limited extent would result in a Slight/negligible magnitude of change and would be of Minor, Adverse significance (not significant)

Visitors to Wildfox Resort (2km, southeast)

7.6.44 This consented adventure resort will be located on Foel Fawr, to the south of Cymmer and west of Croeserw. The site parameters plan indicates that the resort is designed to be contained by a mix of coniferous and deciduous woodland planted around the boundaries. The ZTV study (Figure 7.4) shows only limited visibility in this area as mapping indicates that Foel Fawr is forested, however in practice existing tree cover is limited. Visibility of the Proposed Development from the resort will depend on the density of buildings and tree planting within the resort, and the timing of the construction of both developments. The angle and distance of view would be similar to that from viewpoint 6 albeit likely to be more open particularly in the early stages of the resort opening, and the turbines would be seen beyond the existing ones at Pen y Cymoedd. Effects would be Small scale across a Wide extent of the resort in the Medium-term reducing to more restricted areas and Negligible scale as the resort planting matures. The magnitude of change would be Slight and effects would be of Moderate, Adverse significance (not significant).

Local road and PRow users south and southeast of Cimla (3km, southwest)

7.6.45 This receptor group includes users of local roads and footpaths and residents of a small number of dwellings in this area. As shown by Figure 7.4, most of the visibility in this area would be from the open areas of higher ground, including the open access land near the masts at Foel Fynyddau, rather than routes with public access and the local roads and some

paths are typically hedge and/or tree lined which would further reduce visibility of the Proposed Development. Viewpoint 9 represents this receptor group and indicates that where views do arise (an Intermediate extent), effects would be Large/medium scale. The magnitude of change would be Moderate and effects would be Major/moderate and adverse (significant).

Cilfrew, Mynydd Marchywel and Sarn Helen (3.5km, northwest)

- 7.6.46 This receptor group includes residents and visitors to Cilfrew and recreational users using routes within nearby upland areas, including Sarn Helen, and road users and farms along the local road (Oak View) between Cilfrew and Crynant. As shown by Figure 7.4, most of the visibility in this area would be from the open areas of higher ground, including parts of the open access land, rather than routes with public access. Oak View is mostly hedge and/or tree lined which would further reduce visibility of the Proposed Development. Viewpoints 5 and 8 represent this receptor group and indicate that where views do arise (an Intermediate extent), effects will be Medium/small scale. The magnitude of change would be Moderate/slight and effects would be Moderate and adverse (not significant).

Caerau and users of footpaths and access land at Mynydd Pwll-yr-lwrch (4.5km, southeast)

- 7.6.47 Figure 7.4 indicates a limited area of visibility from the higher ground at the eastern edge of Caerau, as well as limited visibility from a footpath which runs around the western slopes of Mynydd Pwll-yr-lwrch and a more open visibility from a footpath and the open access land on the north-west facing slopes of the hill. Local residents and recreational receptors in this area are represented by viewpoint 19. The turbines of the Proposed Development would appear larger and more distant than the nearest turbines at Pen y Cymoedd and would be far less noticeable than the consented turbines at Foel Trawsant. The effects would be Small scale for an Intermediate extent and the magnitude of change would be Slight. Effects would be Moderate/minor and adverse (not significant).

Neath (5km, west)

- 7.6.48 Figure 7.4 indicates patchy visibility from areas of Neath - predominantly within the western areas of the town, where slopes face eastwards towards the site. As illustrated by viewpoint 18, effects from the lower lying areas of the town would be Negligible scale. Viewpoint 10 illustrates visibility from one of a number of small parks and recreation grounds where views towards the site are available. Existing wind farms are a notable feature of the skyline in these views, but those of the Proposed Development would be noticeably larger, resulting in Small scale effects. The effects would arise for a Localised extent of the settlement and there would be a Slight magnitude of change, resulting in Moderate, adverse (not significant) effects.

Key Routes

Celtic Way (passes through the site)

- 7.6.49 This long-distance walking route passes through the study area in a broadly north-south alignment, passing around the edge of the open upland area at Mynydd Fforch Dwm where four of the turbines which form part of the Proposed Development would be sited.
- 7.6.50 Northbound walkers would first see the turbines as they descend close to Foel Trawsant wind farm. A closer view would arise approximately 1.5km further along the route near the Mountain Centre (viewpoint 4) where there would be open views of the turbines, along with more limited views of the solar panels from the short stretch of route. After ascending through the woodland, there would be close views of the turbines as the route skirts the open upland at Mynydd Fforch Dwm before the route passes beyond the site.

7.6.51 Southbound walkers would first see the Proposed Development for a short stretch of the route as they ascend from Melin Court, before they move into forestry (see viewpoint 1). After passing through forestry and the existing wind farm, there would be close views of the turbines as the route skirts the open upland at Mynydd Fforch Dwm before the route passes beyond the site.

7.6.52 Large and Large/medium scale effects would be Limited in extent. There would be a Moderate magnitude of change and taking account of the fact that users of this route in either direction would have already passed through a wind farm before reaching the site (unless starting nearby), effects would be Moderate and Adverse (not significant).

Cistercian Way (0.7km, west)

7.6.53 This winding route passes broadly east to northwest through the study area. Figure 7.4 indicates a number of areas of visibility of the Proposed Development.

7.6.54 Eastbound walkers would see the turbines in the distance among the existing and consented wind farms (see viewpoint 12) as they approach Pontardawe. The next views would arise some 6km later after passing through Neath, from the open area of higher ground east of Tonna (see viewpoint 2) before the route passes into forestry. Some glimpsed views of turbine blades beyond rising ground and nearby vegetation would arise (see viewpoint 16) as the route passes Tonmawr and beyond the site.

7.6.55 Walkers heading northwest would first see the Proposed Development as they pass close to the existing and consented wind farms at Upper Ogmere and Llynfi Afan. A second short stretch of visibility would arise just beyond this stretch where the turbines would be seen in a similar direction to the closer consented turbines at Foel Trawsant. After this the route would follow a long winding section with no visibility, before passing viewpoint 4, where gaps between the trees would permit a view towards the turbines and solar panels on Mynydd Blaenafon. Some glimpsed views of turbine blades beyond rising ground and nearby vegetation would arise (see viewpoint 16) as the route passes Tonmawr and beyond the site.

7.6.56 Large and Large/medium scale effects would be Limited in extent. There would be a Moderate magnitude of change and taking account of the very restricted areas of visibility, effects would be Moderate and Adverse (not significant).

NCR 47 (1.5km, north)

7.6.57 This cycle route passes to the northwest of the site between Neath and the extensive areas of forestry and wind turbines to the northeast of the site. As this is an offroad route, it is considered to be likely to be used by walkers as well as cyclists and sensitivity is judged to be High/medium as for walking routes. Figure 7.4 indicates two areas of visibility from this route. One is located between existing and consented turbines to the north of the site and effects in this location would be of negligible scale. The second area is as the route passes along the area of higher ground to the east of Tonna (see viewpoint 2).

7.6.58 Large scale effects would be Limited in extent. There would be a Moderate magnitude of change and taking account of the very restricted areas of visibility and the fact that the route frequently passes existing turbines, effects would be Moderate and Adverse (not significant).

St Iltud's Walk (2km, north);

7.6.59 This route passes broadly south to northwest through the study area. Figure 7.4 indicates a number of areas of visibility of the Proposed Development from sections of the route which are shared with other routes previously described. For southbound users visibility would arise

for a short stretch of the route near viewpoint 1 and as the route passes close to existing and consented wind farms to the north of the Site. For northbound route users visibility would arise briefly as they pass viewpoint 4 near the Mountain Centre and again as they pass close to existing and consented wind farms to the north of the Site.

- 7.6.60 Large and Large/medium scale effects would be Limited in extent. There would be a Moderate magnitude of change and taking account of the very restricted areas of visibility, effects would be Moderate and Adverse (not significant).

Specific Viewpoints

- 7.6.61 As noted at section 7.4.26, no specific viewpoints are individually considered within this assessment.

Designated Areas

- 7.6.62 Based on the assessments of the scale of effects at viewpoints as set out in Table 7.7 and at 7.6.18 and 7.6.19 above, some of the designated areas identified in section 7.4.28 would experience negligible effects and do not require detailed assessment:

- Mynydd y Garth (10.5km, northwest) and Mawr Uplands (11.8km, northwest) - As illustrated by viewpoint 12 which represents the closest views from these two SLAs, visual effects would be of Small/negligible scale and effects on character would be of Negligible scale. Taking account of the scale of these effects and the patchy visibility which would limit the extent of effects, effects on the valued qualities of these designated areas are judged to be negligible.

Bannau Brycheiniog National Park (14km, north)

- 7.6.63 The Bannau Brycheiniog National Park (BBNP) extends across the northern part of the study area as shown by Figure 7.5. As indicated by the assessment of effects on character and views provided above (including viewpoints 13 and 14 and sections 7.6.18 and 7.6.19), effects on character and visual receptors within the National Park would be of Negligible scale.

- 7.6.64 Under Section 61 of the Environment Act 1995, the purposes of National Parks are:

"To conserve and enhance the natural beauty, wildlife, and cultural heritage of the National Parks;

To promote opportunities for the understanding and enjoyment of the special qualities (of National Parks) by the public."

- 7.6.65 Figure 7.5 indicates that visibility would arise from south facing slopes of the Black Mountains and Fforest Fawr within the BBNP. As indicated by the assessment of effects on character and views provided above (Viewpoints 13 and 14), effects on character and visual receptors within the National Park would be of Negligible scale.

- 7.6.66 The Special Qualities of the BBNP are set out within the Management Plan 2015-2020. These Special Qualities, their susceptibility to the Proposed Development and the scale and extent of effects are considered in Table 7.8 below.

Table 7.8 Effects on Special Qualities of the BBNP

Special Quality	Susceptibility	Effects
A National Park offering peace and tranquillity with opportunities for quiet enjoyment, inspiration, relaxation and spiritual renewal.	Medium - visibility of large scale development may impact on the perception of tranquillity.	Negligible - the development would be seen in the distance, set in the context of existing wind farms and the developed coastal areas.
A feeling of vitality and healthfulness that comes from enjoying the Park's fresh air, clean water, rural setting, open land and locally produced foods.	Medium - visibility of large scale development may impact on the perception of the rural setting and open land.	Negligible - the development would be seen in the distance, set in the context of existing wind farms.
A sense of place and cultural identity - "Welshness" - characterised by the use of the indigenous Welsh language, religious and spiritual connections, unique customs and events, traditional foods and crafts, relatively unspoilt historic towns, villages and family farms. The continued practices of traditional skills developed by local inhabitants to live and earn a living here, such as common land practices and grazing.	Low - wind farms are modern rather than traditional but carry no association with non-Welsh cultures.	Negligible - the Proposed Development would not be seen from historic towns within the National Park (see Figure 7.5) and would not affect the other qualities listed.
A sense of discovery where people are able to explore the Park's hidden secrets and stories such as genealogical histories, prehistoric ritual sites, medieval rural settlements, early industrial sites, local myths, legends and geological treasures.	Low - this is not a quality which is likely to be affected by wind farm development.	Negligible - the Proposed Development would not impinge on the ability to explore the Park's heritage.
The 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 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.	High - visibility of turbines from the hilltop views may affect perceptions of natural beauty and distract from the appreciation of nearby natural features.	Negligible - the development would be seen in the distance, set on a skyline along with existing wind farms. From areas to the northeast of the Site near Ysradfellte, the turbines would be seen behind others (viewpoint 13) resulting in Negligible scale effects. From the south facing slopes of the Black Mountains, the turbines would be seen to extend the influence of wind farms, which whilst Negligible in the context of visual amenity, would have a Small/Negligible scale effect on this quality across an Intermediate/Localised extent of the BBNP.
A working, living "patchwork" of contrasting patterns, colours, and textures comprising of well-maintained farmed landscapes, open uplands, lakes and meandering rivers punctuated by small-scale woodlands, country lanes, hedgerows, stone walls and scattered settlements.	High - this quality relates to the character of the BBNP as visitors move through it.	Negligible - the development would not affect the character of the BBNP.

Special Quality	Susceptibility	Effects
Extensive and widespread access to the Park's diversity of wildlife and richness of semi-natural habitats, such as native woodlands, heathland and grassland, natural lakes and riparian habitats, ancient hedgerows, limestone pavement and blanket bogs including those of international and national importance	Low - wind farm development outside the BBNP is unlikely to affect habitat within it.	Negligible - the Proposed Development is very distant from the BBNP and would not affect its habitat.
In the context of the UK, geographically rugged, remote and challenging landscapes	Low - wind farm development outside the BBNP would not affect the rugged and challenging terrain, but may affect perceptions of remoteness.	Negligible - the Proposed Development would be seen at a similar distance to existing and consented wind farms.
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.	Low - wind farm development outside the BBNP is unlikely to affect access within it.	Negligible - the Proposed Development would not affect recreational opportunities. It may affect some people's enjoyment of those opportunities, but would typically be seen in views which already include wind farms.
An intimate sense of community where small, pastoral towns and villages are comparatively safe, friendly, welcoming and retain a spirit of cooperation.	Low - wind farm development outside the BBNP is unlikely to affect settlement character and culture within it.	Negligible - the Proposed Development would not be visible from settlements within the BBNP.

7.6.67 Based on the analysis above, a Small/negligible scale effects would arise across an Intermediate/localised extent of the BBNP as a result of the extended presence of wind turbines seen on the skyline in views out from the south facing slopes of the Black Mountains. Taking into account the National value of this quality and its High susceptibility, the Sensitivity of this quality is judged to be High. There would be a Slight/negligible magnitude of change and effects would be of Moderate/minor, adverse significance (not significant) considering effects on this special quality alone.

7.6.68 Effects on all other special qualities would be of Negligible scale and considering all of the special qualities together, there would be a Negligible magnitude of change and effects would be Negligible and Neutral (not significant).

The Gower Peninsula AONB (20km, southwest).

7.6.69 Figure 7.5 illustrates that there would be some areas of visibility of the Proposed Development including from Mumbles Head (viewpoint 15). As viewpoint 15 shows, any views from the AONB towards the Site also includes views of Swansea and the coastal industrial areas and steelworks at Port Talbot as well as wind farm development on the skyline. The Proposed Development would be seen in this context as being barely distinguishable from the existing and consented wind farms and effects on the special qualities of the AONB would be Negligible.

Vale of Neath SLA (1.5km, north)

7.6.70 As shown by Figure 7.2, this SLA encompasses the valley and forested valley sides between Tonna and Glynneath. This locally designated landscape is judged to be of Regional value.

7.6.71 The NPT Landscape and Seascape SPG (2018) identifies the valued features and characteristics of the SLA. These include the valley landform, geology and waterfalls; the varied landcover of 'pastoral and deciduous mosaic providing diversity within the valley and contrasting with the heavily coniferous wooded nature of the upper slopes'; the time depth including prehistoric, Roman, and more recent use including for mining; the tranquillity, remoteness and cross-valley views available from the open upper valley sides; access via footpaths including long-distance routes; 'strong sense of place, coherence, local distinctiveness and cultural identity', and association with artists, poets and photographers.

7.6.72 As indicated by Figure 7.2, visibility of the Proposed Development within the SLA would be limited to five small areas around the edges of the designated area where the upper valley sides are more open:

- To the northeast of the site amongst existing and consented wind turbines;
- to the north of the site (around viewpoint 1);
- to the northwest of the site (around viewpoint 2);
- from the east facing valley sides near Aberdulais (around viewpoint 5), and
- from the open cast works near Glynneath.

7.6.73 Views from some of the walking routes would be affected where they cross the areas of visibility on the upper valley slopes, and this may also affect the perception of tranquillity and remoteness in these areas although these areas already have visibility of existing and consented wind farms. Where visibility arises, effects on views would be at most Large scale and effects on character would be at most Medium scale (near viewpoint 2) - more distant views from locations to the north and northwest (viewpoints 1 and 5) would be less affected. Only the area around viewpoint 5 would have views towards the Proposed Development in the valued views across the valley.

7.6.74 As the Proposed Development is located outside of the SLA and many valued features and characteristics relate to physical features of the SLA, most have both a Low susceptibility to effects and would receive Negligible effects. Elements which would have greater than Low susceptibility and greater than Negligible effects are identified in Table 7.9 below:

Table 7.9 Effects on valued features and characteristics of the Vale of Neath

Valued Feature / Characteristic	Susceptibility	Effects
'sense of place, coherence, local distinctiveness' (i.e character)	High/medium - Given the enclosed medium to small scale and developed nature of the valley landscape	Medium scale effects in a very Limited area near viewpoint 2, Small scale effects in further limited areas to the northwest near viewpoints 1 and 5.
'upper reaches of the valley have a tranquil and remote feeling'	High/medium - wind farms can be perceived as not being tranquil due to their movement, and may affect perceptions of remoteness	Small scale effects near viewpoint 2, other areas are more affected by existing wind farms and effects would be Negligible.

Valued Feature / Characteristic	Susceptibility	Effects
'Footpaths, long distance paths to include St Illtyds Way and bridleways facilitate views across the valley'	High - a wind farm would be likely to affect open views from upper valley slopes.	Effects on visual amenity at viewpoints 1 and 2 would be Large and Large/medium scale; however in these views the wind farm would not be seen in valued cross valley views which look away from the Site. Near viewpoint 5, the Proposed Development would be seen in views across the valley alongside existing and consented turbines and effects would be Medium/small scale.

7.6.75 Considering these effects together, it is judged that Medium and Medium/small scale effects would arise for a Limited extent of the SLA on these qualities of High/medium sensitivity. There would be a Slight magnitude of change and the effects would be Moderate/minor and adverse (not significant).

Dulais Valley SLA (3km, northwest)

7.6.76 As shown by Figure 7.2, this SLA encompasses the valley and valley sides between Aberdulais and Seven Sisters. This locally designated landscape is judged to be of Regional value.

7.6.77 The NPT Landscape and Seascape SPG (2018) identifies the valued 'features and characteristics of the SLA. The description specifically notes that

"The SLA covers the valley sides to reinforce its visual context and therefore includes the unforested uplands of Mynydd Hirfynydd and Mynydd Marchywel as the backdrop to the valley. The SLA covers the valley sides to reinforce its visual context and therefore includes the unforested uplands of Mynydd Hirfynydd and Mynydd Marchywel as the backdrop to the valley. "

7.6.78 The valued qualities of the SLA are identified within the SPG as including the wide valley floor and predominantly open valley sides with treed field boundaries and grown out hedges on the lower slopes and drystone walls on the upper slopes; the local geology; tranquillity and lack of development of the upper ridge areas; sense of time-depth including prehistoric and Roman remains and evidence of post-mediaeval farming contrasted with rectilinear forestry blocks and open-casting; the historic route of along Mynydd Hirfynydd (Sarn Helen); and mining heritage which previously 'provided a strong sense of place and cohesion'.

7.6.79 As the Proposed Development is located outside of the SLA and many valued features and characteristics relate to physical features of the SLA, most have both a Low susceptibility to effects and would receive Negligible effects. Elements which would have greater than Low susceptibility and greater than Negligible effects are identified in Table 7.10 below:

Table 7.10 Effects on valued features and characteristics of the Dulais Valley

Valued Feature / Characteristic	Susceptibility	Effects
Landscape character of predominantly open valley sides with treed field boundaries and grown out hedges on the lower slopes	High - Given the enclosed medium to small scale and rural nature of the valley landscape	Small scale effects near viewpoint 8 at Cilfrew and other nearby areas with open views across the valley towards the site. Outward views are typically contained by

Valued Feature / Characteristic	Susceptibility	Effects
		vegetation and these effects would arise within a Localised extent.
Tranquillity and lack of development of the upper ridge areas	Medium - wind farms can be perceived as not being tranquil due to their movement, and may affect perceptions and lack of development, however it is also noted that these areas are included as 'context'.	Small scale effects near viewpoint 5, with Small/negligible and negligible scale effects on the more distant upper valley sides of Mynydd Marchywel.
The historic route of along Mynydd Hirfynydd (Sarn Helen)	Medium - views from the route are not mentioned as valued and its value relates more to its presence and heritage.	Near viewpoint 5, the Proposed Development would be seen in views across the valley alongside existing and consented turbines and effects on visual amenity would be Medium/small scale. In the context of the existing wind farms effects on the perception of the historic context of the route would be Small scale.

7.6.80 Considering these effects together, it is judged that Small scale effects would arise for a Localised extent of the SLA on these qualities of Medium sensitivity. There would be a Slight/negligible magnitude of change and the effects would be Minor and adverse (not significant).

7.7 Night-time effects

Summary of Visible Aviation Lighting Requirements and Mitigation

7.7.1 The Proposed Development will require visible aviation lighting. This will comprise a single 2000 candela steady red light mounted on the nacelles of T2, T3 and T4, and 200cd lights on T1, T5 and T6. Mid-mast lights will not be required.

7.7.2 Unlike many aviation lights which currently exist, such as on large TV masts, bridges and some existing wind turbines, the lights proposed would include some mitigation. As noted in Appendix 6.1 this includes:

- Automatic (controlled by sensors installed on the turbines) dimming of the 2000 candela lights to a nominal intensity of 200 candela during periods of meteorological visibility in excess of 5 km.
- Directional Intensity which has the potential to reduce the intensity of the lights for nearby receptors located at elevations below the turbine nacelles.
- The switching on and off of lights would be controlled by a timer 30 minutes after sunset until 30 minutes before sunrise, and not by photocells or similar that respond to particular light levels, thereby not incurring effects in the daytime.

7.7.3 This embedded mitigation is included within this assessment.

7.7.4 Appendix 6.1 also provides calculations in relation to the angle at which the lights are seen and their relative brightness from each of the viewpoints. The lights are seen as being dimmer with increasing distance and are specified by the CAA to be dimmer where they are seen from below (as they are designed to be bright for aircraft flying above). Appendix 6.1 notes that a

car brake light seen at 5km would have an illuminance (micro-lumens per m²) of 4. In general, this is a level of visibility and impact from a red light that would be considered relatively insignificant. In the viewpoint analysis (Appendix 7.4), it is noted where Appendix 6.1 identifies that illuminance would be below 4 in clear weather conditions - which is all viewpoints except nearby elevated locations (viewpoints 1 and 2) and the closest areas of Tonmawr (viewpoint 16). However, as no manufacturer guarantees that their aviation lights meet this aspect of the CAA specification, this is not considered to be embedded mitigation and is not taken into account in the assessment of effects.

Approach and Scope

- 7.7.5 The methodology used in this assessment is consistent with Guidelines of Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3) and that in Technical Appendix 7.1.
- 7.7.6 There is a distinction between light pollution or nuisance and the effect of lighting on the character and amenity of the landscape at night. This is not a technical lighting assessment but focuses on the night-time effects as a result of the introduction of new artificial lighting, with consequent effects.
- 7.7.7 This part of the assessment is still an emerging discipline regarding the scope and receptors which would be impacted as a result of the aviation lighting. Both the Landscape Institute GLVIA panel and the Scottish Government Aviation Lighting Working Group (ALWG) are currently working on guidance. It is clear that night-time impacts would occur on the visual amenity of the area, and that night-time effects are important for locations valued for their night skies, especially where these are either part of a national landscape designation, or recognised specifically for dark skies. There has been greater debate regarding the extent of impact on surrounding landscape character, though emerging consensus from the ALWG is that landscape character is not likely to be affected. One of the most recent and relevant determinations by Scottish Ministers (Page 12 of Crystal Rig Wind Farm Phase IV Scottish Ministerial Determination Letter dated 24 March 2021) stated that:

"Reporters conclude that proposed aviation lighting would be a visual impact alone and consider that without being able to see and fully appreciate the features of the landscape and the composition of views, it is not possible to carry out a meaningful landscape character assessment. The Scottish Ministers concur with this conclusion."

Potential Effects

- 7.7.8 The aviation lights would be visible as points of light, especially where there would be a high degree of contrast at the viewpoint (i.e. the lights were seen against a dark sky / dark landmass or where there would be little or no existing artificial light sources present).
- 7.7.9 During periods of greater ambient light, (e.g. sunset, twilight, dusk, dawn) there would be a reduced effect as the contrast of the aviation lighting against the background would be less. The lights would be switched on 30 minutes after sunset until 30 minutes before sunrise. This variation means that in summer the lighting would not be switched on when people are predominantly active and contrast with the background would be reduced. However, in winter the lighting would be switched on during peak active times.
- 7.7.10 Due to the location of the lighting on the turbines relative to the rotating blades, this can result in a blinking effect caused by the screening effect of blades as they travel past the lights. These effects are dependent upon the rotation speed of the blades, direction of wind and the location of the receptor. Where a number of lit turbines are present in the view, such blinking is likely to be at the same frequency but uncoordinated.

Sensitivity of Receptors

- 7.7.11 For landscape receptors, susceptibility is judged based on the degree to which they are currently characterised by darkness. Value is judged based on similar factors as for the daytime assessment unless suggested otherwise. For example, identification of a Dark Sky Park which would increase value; or if value is based on scenic qualities which are not appreciable at night, the value may decrease.
- 7.7.12 For visual receptors, the value attached to night-time views is considered to be low unless there is a particular feature that can be best appreciated in the hours of darkness. This may include views of stars and the night sky that are only possible in particularly dark areas or views of well-known landmarks that are lit up at night. The susceptibility of visual receptors also differs at night reflecting the different activities people undertake in the hours of darkness. For example, drivers using roads at night tend to be more focused on the road and the area illuminated by their headlights than during the day and may have oncoming headlights, cats eyes or other reflective signage drawing their attention, resulting in lower susceptibility. This is particularly the case on unlit rural roads that may be narrow and winding. On the other hand, people taking part in activities requiring darkness, such as stargazing, would be of higher susceptibility

Existing night-time environment of the Study Area

- 7.7.13 Figure 7.7 gives a broad impression of the level of existing lighting within the study area based on satellite observations of light pollution. It illustrates that the existing night-time environment in the study area is typically dark within the open and forested upland areas; slightly lighter in the valleys which include road corridors and settlements; and markedly lighter around the more urban coastal areas and within Swansea.
- 7.7.14 None of the consented or operational wind farms are of sufficient height to require aviation lighting, but it would not be an entirely new feature within the landscape with a number of aviation lights observed towards the west of the study area between the National Park and Swansea.

Zone of Theoretical Visibility

- 7.7.15 Figure 7.8 illustrates the ZTV for the aviation lights on the turbine nacelles within the Proposed Development and illustrates the maximum extent that these would potentially be visible from. Most of the areas of visibility indicated are open upland areas without settlement which would not be expected to be frequented at night unless there are campsites or areas specifically used for enjoyment of dark night skies.
- 7.7.16 Areas of visibility within 5km from the Site include Tonmawr and Croeserw; the Mountain Centre at Bryn Bettws Lodge; the network of local roads southeast of Cimla; and parts of Cilfrew and Caerau. More distant views of the lighting would arise from more elevated areas of settlement at Pontardawe, Neath and Swansea and local roads and farms near Ystradfellte.
- 7.7.17 Effects on landscape or visual receptors outside the areas of visibility shown on the ZTV study would be Negligible and are not considered further.

Night-time Effects on Landscape Character

- 7.7.18 In terms of the potential for landscape character effects at night, these are almost exclusively concerned with perceptions of darkness and an absence of development, as the key

characteristics of landscapes which distinguish the landscape character areas described in character assessments are generally obscured after dark.

- 7.7.19 As detailed above, Figure 7.8 indicates that the primary areas of theoretical visibility of the aviation lights mounted at nacelle height and Figure 7.7 shows the comparative light levels across the study area.
- 7.7.20 The landscapes affected would be those which are predominantly dark (the upland areas) and are sufficiently close to the Site (within approximately 5km) that the introduction of visible aviation lighting nearby would be fundamentally different to other sources of artificial lighting.

Night-time Visual Effects

- 7.7.21 The impact on visual receptors at night is different from the impact in the daytime presented in the main LVIA. The receptors potentially affected are different and their sensitivity may also be different.
- 7.7.22 People in settlements would remain of similar sensitivity. However, road users would attribute a low value to the view, as amenity value would be limited from the roads at night, which reduces their overall sensitivity. Core Paths and other outdoor recreational locations are generally unlikely to be used at night and would have limited amenity value, they are therefore not considered.

Residents and Communities

- 7.7.23 Effects of aviation lighting on the residential amenity of the most affected properties is considered within Appendix 7.5. Views for people at night more widely within the surrounding settlements and dispersed rural properties are judged to be of High susceptibility and Community value, resulting in a High/Medium sensitivity to the proposed aviation lighting.
- 7.7.24 The main visual receptors likely to have views of the aviation lighting are set out at 7.7.16 above. The areas of visibility from Pontardawe, Neath and Swansea would be seen looking across intervening areas of lit settlement (e.g. viewpoints 10, 11) and effects in this context at distances of 7-12km would be of Negligible scale. Effects on receptors within the National Park near Ystrdfellte are considered in relation to the National Park's Dark Sky Park status at 7.7.39 below. The remaining visual receptors requiring detailed consideration are as follows:

Tonmawr (0.8km, southwest)

- 7.7.25 As illustrated by the night photomontage from Viewpoint 7, the lights on the two closest turbines would be seen in views looking along Tonmawr Road where they would be viewed in the context of bright street lighting and lighting in the windows of houses - including along Johns Terrace which is seen running across the lower slopes of Mynydd Blaenafon. Effects in this location would be of Negligible scale.
- 7.7.26 As illustrated by viewpoints 16 and 16a, and Figure 7.8, visibility of the lights would reduce closer to the site and they would not be seen from much of the settlement apart from near viewpoint 16a at the north end of Johns Terrace where one light would be seen nearby above a dark skyline with less influence from other lighting though there are still streetlights and house windows nearby. Effects here would be Medium scale.
- 7.7.27 Effects on Tonmawr at night would be Medium scale for a Limited extent. The magnitude of change would be Slight and effects would be Moderate and Adverse (not significant).

Croeserw (4km, east)

- 7.7.28 As illustrated by the night photomontage from Viewpoint 6, the lights on the two closest turbines would be seen in views looking along Tonmawr Road where they would be viewed in the context of bright street lighting and lighting in the windows of nearby houses. One of the lights would be seen close to the skyline where it would be wholly screened by forestry and another would be close to the treeline. Effects in this location would be of Negligible scale and the lights would not be visible from most of the settlement.
- 7.7.29 Effects on Croeserw at night would be Negligible scale for a Limited extent. The magnitude of change would be Negligible and effects would be Negligible and Neutral (not significant).

Caerau (4.5km, southeast)

- 7.7.30 As illustrated by the wireline and photograph from Viewpoint 19, the lights on two of the turbines would be visible above the horizon, seen through trees in winter. The lights would be seen in the context of nearby street lighting and lights in house windows in the slopes facing towards the viewpoint and effects would be of Negligible scale. Visibility would be screened from other areas of Caerau.
- 7.7.31 Effects on Caerau at night would be Negligible scale for a Limited extent. The magnitude of change would be Negligible and effects would be Negligible and Neutral (not significant).

Mountain Centre at Bryn Bettws Lodge (1.5km, south)

- 7.7.32 As illustrated by the wireline and photograph from Viewpoint 4, the lights on all of the turbines would be seen along the open skyline to the north. From the viewpoint itself, which is located to represent effects on visitors to Afan Bike Park, the lights would be screened in summer. For visitors to the campsite and those staying in the glamping pods, open views from the areas to the rear and east of the Mountain Centre would include the aviation lights, seen spreading across the open vistas to the north which would otherwise be dark apart from limited nearby lighting relating to the use of the site and the nearby dwelling.
- 7.7.33 Effects would be Large scale and would affect a Localised area. The magnitude of change would be Substantial/moderate and effects would be Major/moderate and Adverse (significant).

Network of local roads southeast of Cimla (3km, southwest)

- 7.7.34 Road users in this area at night would have a Low sensitivity. As illustrated by the wireline and photograph from Viewpoint 9, the lights on all of the turbines would be seen along the open skyline to the north. From the viewpoint itself, some of the lights would be screened in summer. As shown by Figure 7.8, most of the visibility in this area would be from the open areas of higher ground rather than routes with public access and the local roads are typically hedge and/or tree lined which would further reduce visibility of the aviation lights.
- 7.7.35 The scale of effects would be Large/medium, affecting a Limited extent. The magnitude of change would be Moderate/slight and effects would be Moderate/minor and Adverse (not significant).

Cilfrew (4.5km, northwest)

- 7.7.36 As illustrated by the wireline and photograph from Viewpoint 8, the lights on all of the turbines would be seen along the open skyline to the north, though from lower lying areas of Cilfrew at least one of the lights would be likely to be seen below the horizon. The lights would be seen above an otherwise dark skyline in the context of views out from a street lit area.

- 7.7.37 Effects would be Large/medium scale and would affect a Limited area at the eastern edge of Cilfrew. The magnitude of change would be Moderate/slight and effects would be Moderate/minor and Adverse (not significant).

Visitors to Dark Sky Parks and Discovery Sites

- 7.7.38 A number of locations are promoted by the Dark Sky Discovery organisation for visitors to appreciate the stars at night. These include Dark Sky Parks and Discovery Sites. Dark Sky Parks are widely promoted and recognised while the Discovery Sites are locally nominated or promoted and may or may not hold events.

Bannau Brycheiniog National Park (14km, North)

- 7.7.39 The BBNP is recognised as an International Dark Sky Park - this is not a designation with accompanying planning policy, but is an indicator of the value of the dark skies in this area. <https://www.breconbeacons.org/things-to-do/activities/stargazing/10-places-to-go-stargazing> provides a guide to visitors seeking to enjoy stargazing within the National Park. Four of the ten locations are more than 35km from the site (Llanthony Priory, Hay Bluff, Sugar Loaf Mountain and Llangorse Lake), the remainder are as follows:

- 7.7.40 Key locations identified for visits at night are:

- Usk Reservoir (30km, North) - no visibility;
- Crai Reservoir (23km, North) - no visibility;
- National Park Visitor Centre (32km, Northeast) - no visibility;
- Pen Rhiw Ddu (18km north) - no visibility;
- Carreg Cennen (26km, Northwest) - no visibility, and
- Craig-y-Nos Country Park and Castle (17.5km, North) - no visibility.

- 7.7.41 While visibility of the turbine lighting will arise from within the BBNP as shown by Figure 7.8, it will not arise from any of the promoted sites (as indicated by the bareground, tip height ZTV study which overstates the visibility of the lights which would be on the nacelle, but extends to cover more of the National Park).

- 7.7.42 The areas of visibility from the southern slopes of the Black Mountains (e.g. Viewpoint 14) are mostly open uplands which are less likely to be frequented at night, with the exception of the 3km stretch of visibility from the A4067 north of Brynammen where southbound road users would see the lights within views that also include settlement lighting and glimpsed views of more nearby aviation lights.

- 7.7.43 Areas of visibility near Ystradfellte would including glimpses of one of more aviation lights seen low on the horizon (e.g. Viewpoint 13 - where the light are screened by woodland), seen in the context of lights at the nearby campsite and individual farms and dwellings in the area.

- 7.7.44 Taking all of these effects into consideration, effects would be of Negligible scale for a Limited extent of the National Park. There would be a Negligible magnitude of change and effects would be Negligible and Neutral.

Dark Sky Discovery sites

- 7.7.45 There are a number of Dark Sky Discovery sites identified within the study area on <https://www.darkskydiscovery.org.uk/dark-sky-discovery-sites/map.html>, as follows:

- Glyncorwg Ponds (4.5km, East) - no visibility;

- Hendre Mynydd car park (10km, East) - no visibility;
- Bwlch Mountain layby (11km, East) - no visibility;
- Garn Eiddel car park (14km, East) - no visibility;
- Gerazim Chapel (15km, Northwest) - no visibility;
- Red Lion Pub, Penderyn (16km, Northeast) - no visibility, and
- Dare Valley Country Park (16km, Northeast) - no visibility.

7.7.46 [Visit Wales](#) also promotes Port Eynon as a place to visit to enjoy night skies within the Gower AONB. Port Eynon Bay lies 35km from the Proposed Development and as shown by Figure 7.5, would have no visibility of the Proposed Development.

7.8 Additional Mitigation

7.8.1 All mitigation for landscape and visual effects is include in the design of the Proposed Development and no additional mitigation measures are proposed.

7.9 Residual effects

7.9.1 Residual effects would be as set out within sections 7.6 and 7.7 above.

7.10 Implications of Climate Change

7.10.1 The landscape within the study area is likely to change as a result of a warming climate, but the precise nature of those changes in not readily predictable. Some natural changes will come about as a result of sea level rises which will alter the shape of the coast and courses of rivers; and as a result of the natural ranges of native vegetation altering in response to increasing temperatures and changes to rainfall patterns. Other changes will arise as a result of human responses to the changing climate, such as different farming patterns.

7.10.2 In addition to changes which do not require planning permission as outlined above, development patterns are likely to alter as a result of efforts to mitigate and adapt to climate change - including the increased deployment of renewable energy and electricity storage projects; changes to the infrastructure of the electricity grid, gas network and vehicle refuelling; and changes to the scale, appearance and location of new housing and commercial developments as climate mitigation and adaptation increasingly inform decisions.

7.10.3 Typically these changes will be gradual but are expected result in marked changes to the current landscape character and views over time.

7.10.4 Given the inherent uncertainty of the exact timing and nature of these changes, this process of landscape change is not taken account of within the judgements made in this assessment. However, this should not be taken to mean that the 'do nothing' scenario for this proposal is the same as 'no change'.

7.11 Cumulative effects

Introduction

7.11.1 In line with GLVIA3 (paragraph 7.5) and SNH guidance on Assessing the Cumulative Impact of Onshore Wind Energy Developments (paragraph 33), the assessment of cumulative effects should focus on whether there are any likely significant cumulative impacts which are reasonably foreseeable and which are likely to influence the decision making of the Proposed Development, rather than an assessment of every potential cumulative effect. As

recommended by the SNH cumulative guidance, this assessment considers the “additional cumulative change which would be brought about by the proposed development” (paragraph 70), assuming other schemes in scenario are already present.

Developments considered

- 7.11.2 The cumulative site search was based on the scope set out within ES section 3.6 and illustrated by Figures 3.4 and Figure 7.9.
- 7.11.3 Solar farms within the 30km search area have been excluded from consideration within this LVIA as they typically do not have effects beyond 2-3km; the nearest solar sites identified are beyond 9km and none within 20km are beyond the pre-application stage.
- 7.11.4 The resultant list of projects for further consideration is as set out within Table 7.8 below.

Table 7.11 Cumulative Site Search results

ID	Site	Number of turbines	Distance from site boundary	Status	Max Height (m)
1	Pen y Cymoedd	76	0.4 km	Operational	145
2	Fynnon Oer	46	1.3 km	Operational	93
3&4	Lynfi Afan	12	5 km	Operational	117
5	Mynydd Brombil	4	7.8 km	Operational	100
6	Maesgwyn Extension	4	9.3 km	Operational	125
8	Maesgwyn	15	10.7km	Operational	125
9	Maerdy	8	12 km	Operational	145
10	Llangynwyd Lower (1)	2	12.3 km	Operational	91
11	Llangynwyd Lower (2 - Cwm Risca)	2	12.5 km	Operational	91
12	Mynydd Bwlfa	9	13.2 km	Operational	125
13	Pant y wal	10	13.9 km	Operational	115
14	Pant y wal extension	8	14.4 km	Operational	125
15&16	Fforch Nest	11	14.6 km	Operational	115
17	Mynydd Y Gwrhyd	2	14.9 km	Operational	100
18	Penrhys /Ferndale	8	15.5 km	Operational	74
19	Laleston	1	16.5 km	Operational	45
20	Mynydd Y Gwair	16	17 km	Operational	127
21	Newton Down	2	17 km	Operational	125
22	Mynydd y Betws	16	18.1 km	Operational	110
23b	Headwind Taff Ely (to replace operational Taff Ely)	7	18.8 km	Consented	110
24	Mynydd Portref	11	19.8 km	Operational	86
25	Mynydd Portref extension	6	20.2 km	Operational	110
26	Rhiwfelin Fach Farm	1	23.3 km	Operational	100
27	Cefn Fforest	1	25.6 km	Operational	77
28	Gelligaer	1	29.6 km	Operational	77 (est)
30	Melin Court	5	2.6 km	Consented	149.9
31	Y Bryn	26 (see below)	2.6 km	Pre-application	250
32	Wildfox Resort		3.2 km	Consented	15
35	Meadow Road - Residential		5.1 km	Consented	N/A
38	Foel Trawsant	11	6.7 km	Consented (and Planning)	145

ID	Site	Number of turbines	Distance from site boundary	Status	Max Height (m)
39	Baglan Industrial Park – Industrial unit		7.2 km	Planning	14
40	Mardon Park – Industrial unit.		7.2 km	Consented	16
41	Hirwaun Power Station		7.6 km	Consented	35
43	Sandvik Osprey - metal processing facility.		8.4 km	Planning	16.5
44	Chain Road - Residential		8.4 km	Consented	N/A
45	Sandfields - Residential		8.5 m	Consented	N/A
46	Upper Ogmore	7	8.6 km	Consented	149.9
48	Aberavon Waterfront – Residential		8.8 km	Consented	N/A
51	ABP Margam Sands – 4 year turbine test	2	10.0 km	Operational (retained WT) Consented (new WT)	25
53	Swansea Uni roof mounted turbines*	n/a	10.8 km	Planning	3.5*
54	Llynfi ERF		11.7 km	Pre-application	45
55	Abergorki	3	12.1 km	Consented	146.5
57	Perthgwynion Farm	1	14.2 km	Operational	86.5
58	Parc Stormy	1	16.4 km	Operational	125
59	Tresgyrch Fawd Fawr	1	16.5 km	Pre-application	150
62	Gelli Feddgaer	2	17.2 km	Pre-application	150
65	Felindre Road - 9 x 4.5 MW gas generators		21.0 km	Consented	12
67	Mynydd Y Glyn	7	21.2 km	Pre-application	180
68	Graig Fatha	1	21.7 km	Operational	126
72	Rhiwfelin Fach Farm	1	23.7 km	Consented	90
73	St Merryn Meat	1	26.6 km	Operational	77
76	Aber Valley	1	28.4 km	Consented	77
77	Twyn Hywel	20	29.0 km	Pre-application	200
79	Queens Dock 1	1	13.8 km	Operational	43
80	Queens Dock 2	1	13.4 km	Operational	77
81	Welsh Water Swansea Bay	1	11.9 km	Operational	79
82	Hirfynydd Energy Park – 50MW Wind, 50MW Solar and battery storage	7	7.8 km	Pre-application	200
83	Mynydd Drumau Solar Farm	N/A	8.2 km	Pre-application	N/A
84	Land Fronting The A484 Solar Farm	N/A	20.3 km	Planning	N/A

7.11.5 From this list, one wind development has been excluded from the detailed assessment due to its nature, scale and distance:

- 51: Two temporary (4 year) test turbines at ABP Margam Sands. These are no more than 25m high, set within an industrial area and do not have the appearance of typical wind turbines.

7.11.6 All remaining wind developments except the early stage Hirfynydd Energy Park are included on Figures 7.9 to 7.11 and visualisations. Where there are operational and consented

schemes on the same site (Taff Ely), the larger scheme has been included in visualisations. For the purposes of detailed assessment, all operational and consented cumulative developments have been included in the baseline and future baseline of the assessment set out above in sections 7.4-7.8.

7.11.7 Amended schemes for 30 Melin Court and 38 Foel Trawsnant were consented after the visualisations had been completed. Melin Court is shown as the amended layout in visualisations, but is colour-coded as being in planning. Foel Trawsnant is shown in visualisations as its previously consented layout, which had the same turbine height but fewer turbines with a smaller blade diameter. This is considered to be a 'worst case' depiction of the potential development given that it involves a greater number of turbines. Both of these wind farms have been considered as a consented within the main assessment.

7.11.8 Wind farms at planning and pre-application stages are:

- 31 Y Bryn - This proposed wind farm is at the pre-application stage and the layout and turbine size may be subject to change during the assessment and application process. A reduction in turbine numbers (to 21, and then 18) and in the size of some turbines was indicated on the project website at the time of preparing this assessment. It has been included as described within the scoping report within Scenario 2 in the cumulative assessment below in order to consider potential worst case effects prior to an application coming forward.
- 59 Tresgyrch Fawd Fawr and 62 Gelli Feddgaer - These are both Screening requests for developments more than 16km from the Site which have not made further progress to date. The potential project at Gelli Faedgaer is not visible from any of the LVIA viewpoints whilst the potential turbine at Tresgyrch Fawd Fawr is potentially visible in the distance as a barely discernible additional turbine amongst Mynydd Y Bettws or Mynydd Y Gwair wind farms from viewpoints 3, 9, 11, 14 15 and 17. Given this lack of intervisibility with the proposals and the separation distance between the sites, the effects of these wind farms would not be expected to interact with those arising from the Proposed Development and cumulative effects are not considered in detail.
- 67 Mynydd Y Glyn and 77 Twyn Hywel - These are both DNS projects at the pre-application stage and would be located more than 21km from the Proposed Development. They would not be visible from any of the LVIA viewpoints. Given this lack of intervisibility with the proposals and the separation distance between the sites, the effects of these future application projects would not be expected to interact with those arising from the Proposed Development and cumulative effects are not considered in detail.

7.11.9 For non-wind developments the majority of developments which are not either consented or operational have been excluded from the detailed assessment as they are beyond 5km and not expected to have more than localised effects as they are either industrial/commercial proposals of no more than 12m in height within an existing similar context (39, 43, 53) or are solar farms.

7.11.10 The remaining two non-wind developments specifically considered and modelled in visualisations are:

- 32 Wildfox Resort - this is included in the future landscape and visual baseline as with all consented development, but given its proximity to the Site its location has been identified within visualisations where relevant, and visual effects on this future receptor have been considered; and
- 54 Llynfi ERF - although this is at pre-application stage, early documentation provides indications of likely location and heights. This was test modelled for all viewpoints included within this LVIA with none indicating potential visibility of the scheme. Given this lack of intervisibility with the proposals and the separation distance between the

sites, the effects of the Llynfi ERF would not be expected to interact with those arising from the Proposed Development and cumulative effects are not considered in detail.

Assessment Scenarios

7.11.11 Taking into account the above considerations, the only project requiring detailed consideration within this cumulative assessment (as it has not been taken into account in the preceding main assessment) is Y Bryn and the cumulative assessment scenarios are:

- Scenario 1 - Mynydd Fforch Dwm with existing and consented development (as set out in sections 7.6 and 7.7 above and illustrated by the cumulative ZTV study provided as Figure 7.10; and
- Scenario 2 - Mynydd Fforch Dwm with existing and consented development and Y Bryn (as set out below).

7.11.12 Only the receptors identified as receiving Slight or greater magnitude effects as a result of the Proposed Development are considered. Landscape and visual receptors that are assessed to receive effects of Slight-Negligible or Negligible magnitude (both localised and overall) from the Proposed Development are not included in the cumulative assessment, as an effect of such low magnitude manifestly adds nothing or very little regardless of the effects of other developments.

Cumulative ZTV Study

7.11.13 Figure 7.11 provides a cumulative ZTV study for the Proposed Development with Y Bryn wind farm. It indicates that combined visibility of both wind farms is constrained by terrain and forestry and tends to arise mostly from areas of open higher ground. Areas where only the Proposed Development would be visible arise primarily within 7km from the site, but there is also a notable area within the BBNP around Ystradfellte. Extensive areas where only Y Bryn would be visible arise to the southeast of the study area.

Cumulative Viewpoint Analysis

7.11.14 The scale of effect at viewpoints arising from the Proposed Development to a baseline including Y Bryn wind farm are considered in Table 7.12 below:

Table 7.12 Cumulative Viewpoint Analysis Summary - Scenario 2

Viewpoint Number	Viewpoint	Scale of Landscape Effect	Scale of Visual Effect
1	St Illtyd's Walk near Carn Caca	Small	Large/medium
2	SLA 3, east of Tonna	Medium/small *	Large/medium *
3	SLA 6, By-way above Cynonville	Negligible	Small
4	Afan Bike Park	Large/medium	Large
5	SLA 2/3, Sarn Helen	Small/Negligible *	Small *
6	Heol-Y-Fedw, Croeserw	Negligible	Negligible
7	Tonmawr Road, Tonmawr	Large/medium	Large
8	Cilfrew	Small	Medium/small
9	Bridleway near Cimla Equestrian Centre	Medium	Large/medium
10	Heol Penlan, Neath Abbey	Negligible	Small/negligible *
11	Beach Path, Swansea University Bay Campus	Negligible	Negligible *
12	SLA 1, Cwn Clydach Walk outside	Negligible	Negligible *

Viewpoint Number	Viewpoint	Scale of Landscape Effect	Scale of Visual Effect
	Pontardawe		
13	National Park, Comin y Rhos	Negligible	Negligible
14	National Park, above Ystalfera	Negligible	Negligible
15	AONB, Mumbles Head	Negligible	Negligible
16	John's Terrace, Tonmawr	Large/medium	Large
17	Cimla Common	Negligible	Negligible
18	A474 flyover, Neath	Negligible	Negligible
19	Pleasant View, Caerau	Negligible	Small (winter)

*Effects marked * are those which are different to the main LVIA (Scenario 1).*

7.11.15 Based on the viewpoint analysis above it can be seen that effects would mostly be the same as for the main assessment (Scenario 1), except as follows:

- Effects from locations 2-5km to the west and northwest of the Site (represented by viewpoints 2 and 5) where Y Bryn would be seen occupying a wide extent of the horizon beyond the Proposed Development, such that the addition of the Proposed Development would make a less marked change to the skyline.
- Visual effects from more distant areas to the west and southwest (Neath, Swansea and near Pontardawe - viewpoints 10-12), where the scale and extent of Y Bryn along the skyline would reduce the degree of change that would arise from the addition of the Proposed Development.

Cumulative Effects on Landscape Character

7.11.16 Taking into account the distribution of combined visibility and the viewpoint analysis above it is judged that effects on the two host landscape character areas for the Proposed Development, 11 Cwm Afan and Cwm Pelenna and 18: Mynydd Resolfen, Craig-y-Llyn & Mynydd Ynyscorrwg, would be the same as for Scenario 1.

17: Feol Fynyddau (0.8km, west)

7.11.17 As shown on Figure 7.1, Y Bryn wind farm would wrap around the eastern edge of this character area at distances of 1-2km. Figure 7.11 illustrates that visibility of the Y Bryn turbines would be widespread within the character area, and that areas of combined visibility of both wind farms would be confined to areas of higher ground where Y Bryn and the Proposed Development would be seen by turning to look in different directions rather than together in the same view. In the context of widespread views of Y Bryn, changes to character arising from the Proposed Development would be less pronounced. Effects on this character area of Medium/low sensitivity would be Medium/small scale, affecting an Intermediate extent of the character area. There would be a Moderate/slight magnitude of change to the character and effects would be of Moderate/minor, Adverse significance (not significant).

10: Mynydd Bychan (3.6km, south)

7.11.18 As shown on Figure 7.1, Y Bryn wind farm would be located 3.6km to the southeast of this character area. Figure 7.11 illustrates that visibility of the Y Bryn turbines would be widespread within the character area, and that areas of combined visibility of both wind farms would be confined to areas of higher ground. Near viewpoint 2, the two wind farms would be seen looking in broadly the same direction, with the Proposed Development closer than Y

Bryn; near viewpoint 9 (though not at viewpoint 9), the two wind farms would be seen roughly equidistant and looking in different directions.

7.11.19 In the context of close and widespread views of Y Bryn, changes to character arising from the Proposed Development would be reduced to Negligible scale. The magnitude of change would be Negligible and impacts would be Negligible and Neutral (not significant).

Cumulative Visual Effects

7.11.20 This assessment considers two types of cumulative visual effect:

- Combined views which “occur where the observer is able to see two or more developments from one viewpoint”. Combined visibility may either be in combination (where several developments are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various developments); and
- Sequential views which 'occur when the observer has to move to another viewpoint to see different developments.'

7.11.21 This section assesses the anticipated cumulative visual effects arising from the proposal in combination with the existing and approved developments, and the proposed development. The main linear routes that share combined intervisibility in the study area are then summarised to anticipate the likely sequential views.

7.11.22 Taking into account the distribution of combined visibility and the viewpoint analysis above it is judged that effects on the following visual receptors would be the same as for Scenario 1.

- Users of PRow across the Site and within 2km (includes Site);
- Tonmawr (0.8km, southwest);
- Wildfox Resort (2km, southeast) - taking account of Foel Trawsant turbines between this receptor and Y Bryn; and
- NCR 47 (1.5km, north).

Visual Receptor Groups

Local road and PRow users south and southeast of Cimla (3km, southwest)

7.11.23 As shown on Figure 7.11, Y Bryn wind farm would be located approximately 5km to the southeast of this receptor group. Figure 7.11 also illustrates that visibility of the Y Bryn turbines would be more limited than that of the Proposed Development in this area. Taking into account local screening by hedges and trees, and that the two wind farms would be seen looking in different directions, combined views are likely to arise infrequently except from the open access land at Foel Fynyddau near the masts and effects would be unchanged from Scenario 1.

Cilfrew, Mynydd Marchywel and Sarn Helen (3.5km, northwest)

7.11.24 As shown on Figure 7.11, Y Bryn wind farm would be located approximately 8km to the southeast of this receptor group. Figure 7.11 also illustrates that visibility of the Y Bryn turbines would be similar to that of the Proposed Development in this area with the exception of lower lying areas including Cimla. As illustrated by viewpoint 5, the two wind farms would be seen looking in the same direction, with Y Bryn seen beyond the Proposed Development and occupying a wider extent of the skyline. In this context, effects would be Small scale (except at Cilfrew where they would remain Medium/small) for an Intermediate extent. The

magnitude of change would be Slight and effects would be Moderate/minor and adverse (not significant).

Caerau and users of footpaths and access land at Mynydd Pwll-yr-lwrch (4.5km, southeast)

7.11.25 As shown on Figure 7.11, Y Bryn wind farm would be located approximately 1.5km to the west of this receptor group. Figure 7.11 also illustrates that visibility of the Y Bryn turbines would be more widespread than the Proposed Development in this area. As illustrated by viewpoint 19, the two wind farms would be seen separated but in broadly the same direction, with Y Bryn seen nearby alongside Foel Trawsnant. In this context, the addition of the Proposed Development would constitute a less pronounced change to views compared to Scenario 1 and effects would be of Negligible scale. The magnitude of change would be Negligible and effects would be Negligible and neutral (not significant).

Neath (5km, west)

7.11.26 As shown on Figure 7.11, Y Bryn wind farm would be located approximately 8.5km to the southeast of this receptor group. Figure 7.11 also illustrates that visibility of the Y Bryn turbines would be very similar to that of the Proposed Development in this area. As illustrated by viewpoint 10, the two wind farms would be seen separated but in broadly the same direction on the skyline, with Y Bryn seen nearby alongside and more prominently than Foel Trawsnant. In this context, the addition of the Proposed Development would constitute a less pronounced change to views compared to Scenario 1 and effects would be of Negligible scale. The magnitude of change would be Negligible and effects would be Negligible and neutral (not significant).

Key Routes

Celtic Way (passes through the site)

7.11.27 As shown by Figures 7.4 and 7.11, this route passes through the site of Y Bryn wind farm within forestry and the main area of combined visibility would be as the route passes close to the consented Foel Trawsnant wind farm. In this context it is judged that effects arising from the Proposed Development would not be altered by the presence of Y Bryn wind farm and would remain the same as for Scenario 1.

Cistercian Way (0.7km, west)

7.11.28 As shown by Figures 7.4 and 7.11, this route passes through the site of Y Bryn wind farm within forestry and the main areas of combined visibility would be short stretches near viewpoint 2 and northeast of Mynydd Pwll-yr-lwrch. In this context it is judged that effects arising from the Proposed Development would not be altered by the presence of Y Bryn wind farm and would remain the same as for Scenario 1.

St Illtyd's Walk (2km, north);

7.11.29 As shown by Figures 7.4 and 7.11, this route passes through the site of Y Bryn wind farm within forestry and the main areas of combined visibility would be a short stretch near viewpoint 1. In this context it is judged that effects arising from the Proposed Development would not be altered by the presence of Y Bryn wind farm and would remain the same as for Scenario 1.

Designated Areas

Vale of Neath SLA (1.5km, north)

7.11.30 As shown by Figures 7.2 and 7.11, Y Bryn wind farm would be located approximately 6km to the southeast of this SLA and would be seen beyond the Proposed Development in views from the upper valley sides (Viewpoints 1, 2 and 5). As indicated by Figure 7.11, visibility of the Proposed Development would be slightly more widespread than combined visibility of both wind farms. The viewpoint analysis indicates some limited reductions in some effects on character and views from the Proposed Development as a result of the wide extent of the skyline occupied by Y Bryn: Effects on the valued features and characteristics of the SLA are considered in Table 7.13 below:

Table 7.13 Effects on valued features and characteristics of the Vale of Neath

Valued Feature / Characteristic	Susceptibility	Effects
'sense of place, coherence, local distinctiveness' (i.e. character)	High/medium - Given the enclosed medium to small scale and developed nature of the valley landscape	Medium/small scale effects in a very Limited area near viewpoint 2, Small and Small/negligible scale effects in further limited areas to the northwest near viewpoints 1 and 5.
'upper reaches of the valley have a tranquil and remote feeling'	High/medium - wind farms can be perceived as not being tranquil due to their movement, and may affect perceptions of remoteness	Small scale effects near viewpoint 2.
'Footpaths, long distance paths to include St Illtyds Way and bridleways facilitate views across the valley'	High - a wind farm would be likely to affect open views from upper valley slopes.	Effects on visual amenity at viewpoints 1 and 2 would be Large/medium scale; however in these views the wind farms would not be seen in valued cross valley views which look away from the Site. Near viewpoint 5, the two wind farms would be seen in views across the valley alongside existing and consented turbines and effects would be Small scale.

7.11.31 Considering these effects together, it is judged that Medium/small scale effects would arise for a Limited extent of the SLA on these qualities of High/medium sensitivity. There would be a Slight magnitude of change and the effects would be Moderate/minor and adverse (not significant).

Dulais Valley SLA (3km, northwest)

7.11.32 As shown by Figures 7.2 and 7.11, Y Bryn wind farm would be located approximately 7.5km to the southeast of this SLA and would be seen beyond the Proposed Development in views (Viewpoints 5 and 8). As indicated by Figure 7.11, visibility of the Proposed Development would be slightly more widespread than combined visibility of both wind farms, particularly at the southern end of the valley around Cilfrew. The viewpoint analysis indicates some limited reductions in some effects on character and views from the Proposed Development as a result of the wide extent of the skyline occupied by Y Bryn: Effects on the valued features and characteristics of the SLA are considered in Table 7.14 below:

Table 7.14 Effects on valued features and characteristics of the Dulais Valley

Valued Feature / Characteristic	Susceptibility	Effects
Landscape character of predominantly open valley sides with treed field boundaries and grown out hedges on the lower slopes	High - Given the enclosed medium to small scale and rural nature of the valley landscape	Small scale effects around Cilfrew and Small/negligible scale effects where both wind farms can be seen (e.g. Viewpoint 5)
Tranquillity and lack of development of the upper ridge areas	Medium - wind farms can be perceived as not being tranquil due to their movement, and may affect perceptions and lack of development, however it is also noted that these areas are included as 'context'.	Small scale effects near viewpoint 5, with Small/negligible and negligible scale effects on the more distant upper valley sides of Mynydd Marchywel.
The historic route of along Mynydd Hirfynydd (Sarn Helen)	Medium - views from the route are not mentioned as valued and its value relates more to its presence and heritage.	Near viewpoint 5, the Proposed Development would be seen in views across the valley alongside existing and consented turbines with Y Bryn seen occupying a wide extent of the horizon beyond. Effects on visual amenity from the addition of the Proposed Development would be Small scale. Effects on the perception of the historic context of the route would be Negligible scale.

7.11.33 Considering these effects together, it is judged that although there are some limited reductions in the scale of effects, the magnitude and significance of effects would remain the same as for Scenario 1.

Cumulative Night-time Effects

7.11.34 The proposed aviation lighting scheme for Y Bryn is presently unknown. Given the scale of the wind farm it is likely that proximity activated lighting (such that the lights would only be on if there was a close approach from an aircraft), or cardinal lighting (only certain turbines would be lit), or both options combined may be proposed. Given this uncertainty this matter cannot be assessed at this time.

7.12 Summary

7.12.1 The Proposed Development would introduce additional, larger turbines to the southwest of the existing and consented Ffynon Oer, Pen y Cymoedd and Melin Court wind farms.

Construction/Decommissioning Stage Effects

7.12.2 Construction and decommissioning stage effects would be substantively the same. They would involve short-term activities and effects which would not be significant.

7.12.3 The greatest effects during the construction phase would arise from the standing turbines, and large cranes used to erect these, during the final stages of construction – by which point the effects would be the same as for those during operation.

Operational Stage Effects

Effects on Landscape Character

- 7.12.4 Significant effects would arise on the 11: Cwm Afan and Cwm Pelenna landscape character areas which would be host to two of the turbines and the solar panels at Mynydd Blaenafon - this part of the character area has more in common with the adjacent character area 18: Mynydd Resolfen, Craig-y-Llyn & Mynydd Ynyscorrwg than it does with the more typical valley character.
- 7.12.5 Significant changes to the character of this area would arise from the change of the site from its present state (and future baseline of forestry) to become a renewable energy development, and a sense of proximity to the turbines as a result of relatively close views from lower lying areas in and around Tonmawr and Efail-fach.

Visual Effects

- 7.12.6 Significant visual effects would arise for receptors within 2km of the site to the west, east and north, and 3km to the south. The receptor groups within this area include:
- Users of PRoW and access land across the Site and within 2km who would experience close view of the turbines from open stretches of rights of way and access land.
 - Tonmawr (1.0km, southwest) - where residents and visitors would have open views towards the two closest turbines, solar panels and access track from Tonmawr Road and from Dan y Coed and more restricted views from Johns Terrace and Blaenafon Terrace.
 - Local road and PRoW users south and southeast of Cimla (3km, southwest) who would have views of turbines from local roads and footpaths where not screened by hedges and trees, and from the open access land at Foel Fynyddau.

Designated Areas

- 7.12.7 Effects on the Bannau Brycheiniog National Park, Gower Peninsula AONB, Historic Parks and Gardens and Special Landscape Areas within 15km of the site have been assessed. No significant effects would arise upon these national or local landscape designations.

Night-time Effects

- 7.12.8 The Proposed Development comprises turbines of over 150m in height and, as such, are required by air traffic safety policy to include visible aviation lighting. The Proposed Development includes an aviation lighting scheme that will gain approval from the CAA to reduce visual effects compared to the standard CAA requirement (Appendix 6.1).
- 7.12.9 The only significant night-time effects would be on people staying at the camp site or in the glamping pods at Bryn Bettws Lodge, where they would have close open views of the turbine lights set against a dark sky as they move about the site.

Cumulative Effects

- 7.12.10 Existing, consented and proposed developments within 30km of the site have been considered within this assessment. The majority of developments are either existing or consented (and as such form part of the baseline of future baseline) and are taken into account in the main LVIA. Wind farms recently in planning include Melin Court and Foel Trawsnant, which are minor modifications to consented schemes which would not be expected to alter cumulative effects.

7.12.11 Other developments in planning tend to be either housing or industrial projects set within a context similar to the nature of the developments proposed and at sufficient distance from the Site that cumulative effects would not arise. A number of pre-application projects were also identified, with most being distant and not visible from the assessment viewpoints - again cumulative effects would not arise.

7.12.12 The only project identified as requiring detailed consideration was Y Bryn wind farm, a proposal located 2.6km to the southeast of the Site. This proposal was assessed based on its published scoping layout. There would be no change to the significant effects arising from the Proposed Development in the context of Y Bryn wind farm; the only differences to effects would be minor reductions to non-significant effects in areas close to the Y Bryn site.

7.12.13 A summary of the assessment is set out in Table 7.15 and 7.16 below.

7.13 References

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- <https://www.darkskydiscovery.org.uk/dark-sky-discovery-sites/map.html>,
- Visit Wales https://www.visitwales.com/inspire-me/days-out/dark-sky-destinations-go-stargazing-wales-winter?gclid=EAlaIqobChMI9_ihxt-b-wIVvGDmCh03MQmuEAAYASAAEgL9QvD_BwE&gclidsrc=aw.ds)

7.13.1 Effects on receptors as a result of the addition of the Proposed Development to a baseline existing and consented development (as set out within section 7.6) are summarised below. Only the detail for receptors predicted to experience significant effects are entered in the summary table. Receptors that would experience non-significant effects of at least Slight significance are grouped together.

Table 7.15 Summary of effects (Scenario 1) - Proposed Development

Receptor	Description of effects	Sensitivity	Magnitude	Residual effect	Significant / not significant
Operational Phase					
<i>Landscape Character</i>					
11: Cwm Afan and Cwm Pelenna (includes Site)	Changes to landscape character within the Site and the areas of visibility in and around Tonmawr and Efail-fach.	Medium	Moderate	Major/Moderate, Adverse	Significant
10: Mynydd Bychan 17: Feol Fynyddau 18: Mynydd Resolfen, Craig-y-Llyn & Mynydd Ynyscorrwg	-	-	-	-	Not significant
<i>Visual Receptor Groups</i>					
Users of PRow and access land across the Site and within 2km (includes Site)	Close view of the turbines from open stretches of rights of way and access land.	High/medium	Substantial/Moderate	Major/moderate, Adverse	Significant
Tonmawr (0.8km, SW)	Open views towards the two closest turbines, solar panels and access track along Tonmawr Road and more restricted views from John's terrace.	High/medium	Substantial	Major, Adverse	Significant
Local road and PRow users south and southeast of Cimla (3km, SW)	Views of turbines from local roads and footpaths where not screened by hedges and trees, and from the open access land at Foel Fynyddau.	High/medium	Moderate	Major/moderate, Adverse	Significant
Visitors to Miners Museum and users of nearby routes and access land;	-	-	-	-	Not significant

Receptor	Description of effects	Sensitivity	Magnitude	Residual effect	Significant / not significant
Wildfox Resort; Cilfrew, Mynydd Marchywel and Sarn Helen; Caerau and users of footpaths and access land at Mynydd Pwll-yr-lwrch; Neath					
<i>Key Routes</i>					
Celtic Way; Cistercian Way NCR 47 St Iltyd's Way	-	-	-	-	Not significant
<i>Landscape Designations</i>					
Vale of Neath SLA Dulais Valley SLA	-	-	-	-	Not significant
<i>Visual Receptors at Night</i>					
Mountain Centre at Bryn Bettws Lodge (1.5km, South)	Open and close views of lights from campsite and glamping pods.	High/medium	Substantial/Moderate	Major/Moderate, Adverse	Significant
Tonmawr Croeserw Caerau Network of local roads southeast of Cimla Cilfrew	-	-	-	-	Not significant

7.13.2 Effects on receptors as a result of the addition of the Proposed Development to a baseline existing and consented development and Y Bryn wind farm (as set out within section 7.11) are summarised below. Only effects which differ from scenario 1 are included in the summary table.

Table 7.16 Summary of Cumulative Effects (Scenario 2) - Proposed Development with Y Bryn wind farm

Receptor	Description of effects	Sensitivity	Magnitude	Residual effect	Significant / not significant
Construction Phase					
<i>Landscape Character - as Table 7.15 except:</i>					
17: Feol Fynyddau	-	-	-	-	Not significant
10: Mynydd Bychan	-	-	-	Negligible	Not significant
<i>Visual Receptor Groups - as Table 7.15 except:</i>					
Cilfrew, Mynydd Marchywel and Sarn Helen	-	-	-	-	
Caerau and users of footpaths and access land at Mynydd Pwll-yr-lwrch; Neath	-	-	-	Negligible	Not significant
<i>Key Routes - as Table 7.15</i>					
<i>Landscape Designations - as Table 7.15 except:</i>					
Vale of Neath SLA	-	-	-	-	Not significant

8 Noise and Vibration

8.1 Introduction

- 8.1.1 This chapter considers the likely significant effects with respect to the noise and vibration associated with the construction, operation and decommissioning of the Proposed Development on residents of nearby dwellings.
- 8.1.2 This chapter is supported by the following figure and technical appendices which are referenced throughout the text:
- Figure 8.1: Noise Assessment Locations
 - Technical Appendix 8.1: Environmental Noise Assessment.
- 8.1.3 The assessment considers the potential significant noise effects of the construction and operation of the Proposed Development. Assessment of the operational noise effects accounts for the cumulative effects of the Proposed Development with other nearby wind farms including the operational Pen y Cymoedd Wind Farm (east of the Site) and the Fynnon Oer Wind Farm. Other, more distant wind farms were not considered as they do not make an acoustically relevant contribution to cumulative noise levels (see details in Appendix 8.1).
- 8.1.4 For the construction phase, details of relevant working practices, traffic routes, and proposed working hours are considered in Chapter 4 (Proposed Scheme Description), the draft Construction Environmental Management Plan (CEMP) (Appendix 4.1) and Chapter 13: Transport and Access.
- 8.1.5 Further details and explanation of chapter-specific terminology are provided in Technical Appendix 8.1 and the glossary in the ES (Chapter 16).

Statement of competence

- 8.1.6 The noise and vibration assessment was undertaken by Matthew Cand of Hoare Lea LLP (HL). Matthew (Dipl. Eng., PhD, MIOA) is a full member of the Institute of Acoustics. He is an Associate Director at Hoare Lea LLP who has responsibility for running the environmental noise group, which has a focus on Environmental Impact Assessments (EIAs). He has over 16 years' experience in the assessment of environmental acoustics and has conducted more than 50 noise assessments for EIA of Wind Farms. Matthew is an expert in the assessment of wind farm noise and is one of the authors of the Institute of Acoustics Good Practice Guide (IOA GPG - Ref. 8-2). He has also been engaged as expert witness at planning inquiries and noise nuisance cases.

8.2 Policy Context

- 8.2.1 This assessment is carried out in accordance with the principles contained within the following legislation and guidance:
- Control of Pollution Act (CoPA) 1974 (Ref 8-3);
 - Planning Policy Wales (Ref 8-4);
 - Technical Advice Note (Wales) 11: Noise (Ref 8-5);
 - Future Wales: the National Plan 2040 (Ref 8-6);
 - The Assessment and Rating of Noise from Wind Farms (ETSU-R-97) (Ref 8-1);
 - Institute of Acoustics, a Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA GPG) (Ref 8-2);

- British Standard BS 5228 'Noise control on construction and open sites', Parts 1 & 2 (Ref 8-7);
- British Standard BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' (Ref 8-8);
- Calculation of Road Traffic Noise (CRTN) (Ref 8-9);
- Design Manual for Roads and Bridges (DMRB) (Ref 8-10).

8.2.2 A full discussion of the above legislation and guidance is included in Technical Appendix 8.1.

8.3 Assessment methodology

Predicting effects

Criteria for Assessing Magnitude of Change

- 8.3.1 Assessment of construction noise has been completed in accordance with BS 5228-1 (Ref 8-7); predicting construction noise levels using reference emissions data for typical construction plant and activities, at fixed locations (e.g., the wind turbines, Site compounds or substations etc.) as well as haul routes within the Site. The BS 5228 calculated levels are then compared with the construction noise criteria. Assessment of construction related traffic on public roads has been completed using the methodology provided by Calculation of Road Traffic Noise (CRTN) and the guidance of the Design Manual for Roads and Bridges (DMRB). The relevant criteria are set out in Section 3.3 of Technical Appendix 8.1, with an impact scale from negligible through minor to moderate and major. Criteria for the assessment of vibration associated with construction are also presented in Section 3.3 of Technical Appendix 8.1.
- 8.3.2 Decommissioning is likely to result in less noise than during construction of the Proposed Development and is therefore not considered further in this chapter.
- 8.3.3 Operational wind turbine noise has been assessed using the methodology contained in ETSU-R-97 (Ref 8-1), which considers total cumulative noise from all wind turbines at each noise sensitive receptor location. These predictions are compared to noise limits derived from baseline background noise levels (as set out below in section 8.4). Predicted noise levels are provided following best practice guidance in the IOA GPG. For operational wind turbine noise, the assessment in Technical Appendix 8.1 determines whether noise levels (including cumulative contributions from other wind farms) are below or above the ETSU-R-97 criteria.
- 8.3.4 Noise from operation of the substation and solar array has been assessed using the methodology in BS 4142, which compares noise from the specific source (including a correction for the character of the noise) with typical baseline background noise levels. This uses the same scale as construction noise i.e., from negligible through minor to moderate and major.
- 8.3.5 As the wind turbines and other plant considered are assessed under different criteria, in-combination noise effects were assessed on a qualitative basis.

Criteria for Assessing Significance

- 8.3.6 Sensitivity has been determined on the basis that all noise sensitive receptors considered in this chapter are residential and therefore of high sensitivity.
- 8.3.7 For construction noise and operational noise from the substation and solar array, the magnitude of impacts translate directly to their significance, given all receptors are of high sensitivity, with a scale of significance from negligible, through minor to moderate and major. Major and moderate effects are considered Significant in the context of this EIA.

- 8.3.8 For operational wind turbine noise, acceptable limits for wind turbine noise are clearly defined in ETSU-R-97; accordingly, predicted operational noise levels which are below the ETSU-R-97 criteria are considered Not Significant in the context of the EIA. At some locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible, which could represent an adverse effect. However, if operational noise immission levels comply with the criteria of the guidance commended by planning policy for the assessment of wind farm noise, they are therefore not significantly adverse.
- 8.3.9 If predicted noise levels are above the ETSU-R-97 criteria, effects are considered to be Significant in the context of the EIA. This also applies when considering potential in-combination effects of operational noise from other equipment considered as part of the Proposed Development.

Consultation

- 8.3.10 The scoping report for the Proposed Development (February 2022) outlined the methodology to be used for the present assessment, and in particular proposed to undertake the assessment of operational noise from the Proposed Development on the basis of the data previously measured at neighbouring properties as part of the assessment for the Pen-y-Cymoedd Wind Farm.
- 8.3.11 However, the scoping response (June 2022) from Planning and Environment Decision Wales (PEDW) disagreed with the above approach to reuse the Pen-y-Cymoedd (PYC) survey data, because the survey was undertaken in 2008 and that both schemes may not "share the same sensitive receptors." However, it was pointed out in response to PEDW (09 September 2022) that the concerns were not valid for several reasons (as detailed in Appendix 8.1):
- noise environment in the area is considered unlikely to have materially changed;
 - ETSU-R-97 guidance requires that background noise surveys are not influenced by operational turbines;
 - the surveys for PYC Wind Farm comprised properties which were considered sufficiently representative of the closest locations to the Proposed Development.
- 8.3.12 This was set out in a detailed discussion with Dick Bowdler, an independent consultant appointed by Neath Port Talbot County Borough Council (NPTCBC), who agreed with the proposed approach to baseline, subject to several detailed considerations which were taken into account in the analysis (as detailed in Appendix 8.1). Therefore the concerns raised by PEDW were robustly addressed in consultation with NPTCBC.
- 8.3.13 In relation to the proposed approach to operational noise assessment, based on ETSU-R-97, Mr Bowdler noted that
- [Although] ETSU-R-97 is endorsed by government that does not relieve the assessor of the need to describe the impact of the development. As with other disciplines there should be a clear explanation of the impact. It is not sufficient (or accurate) to say, for example, that where ETSU-R-97 limits are met there is no impact.*
- 8.3.14 As noted above, compliance with ETSU-R-97 can equate to adverse effects for some of the closest receptors due to audible noise, but these effects are not considered significant.
- 8.3.15 Mr Bowdler also undertook a review of a draft version of this assessment as part of the Pre-Application Consultation (PAC) process on behalf of NPTCBC in a report dated 31 March 2023. The review did not raise any significant concerns and re-iterated that the approach to baseline noise levels was considered suitable and agreed with the choice of lower ETSU-R-97 noise limit retained in the assessment. But the review report also made a number of recommendations to consider: these are summarised in section 3.5 of Appendix 8.1, and include: consideration of additional properties and potential cumulative impacts, significance of impact, additional details for the assessment of the substation and solar plant, night-time

noise limits and construction noise. These comments were taken into account in the revised assessment detailed in Appendix 8.1 and the present chapter. The review also proposed a planning condition wording for operational noise from the Proposed Development wind turbines which included penalties for character in the noise (including tonality and amplitude modulation).

Assumption and Limitations

- 8.3.16 For construction noise, 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 that these items of equipment are all used at the closest point to receptor locations, which is considered to be a precautionary assumption, with noise levels lower than predicted for much of the construction period.
- 8.3.17 For operational noise from the proposed solar array and substation, in the absence of a detailed layout and finalised proposal, the assessment is based upon experience of similar schemes and typical associated noise emission levels. However, the final equipment selection and installation arrangements would need to be made on the basis of meeting the proposed criteria.
- 8.3.18 The exact model of wind turbine to be used for the Proposed Development will be the result of a future tendering process and therefore a representative candidate turbine model has been assumed for this noise assessment. This candidate was selected as typical (on a robust basis) of the type and size of turbine that would be used for the Proposed Development, therefore likely to result in noise immission levels similar to those presented.
- 8.3.19 Whilst some assumptions 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 noise and vibration effects.

8.4 Baseline conditions

Current Baseline

- 8.4.1 The Development is located north and north-east of the settlement at Tonmawr. Isolated properties can also be found east of Tonmawr including Fforch-dwm Farm on Mynydd Fforch-dwm, which is involved with the Proposed Development. The area north and north-east of the Site has a comparably very low population density with the closest dwellings located more than 3 km away.
- 8.4.2 The noise environment in the surrounding area generally comprises a mix of 'natural' and man-made sources. The former includes wind-disturbed vegetation, birds, farm animals and as well as, to varying extent, noise from water courses such as the Pelenna River in particular. Other sources of noise include intermittent local road and agricultural vehicle movements, as well as noise from operational wind turbines at some of the properties (in some wind conditions).

Study area

- 8.4.3 The study area for the assessment of operational noise includes the noise-sensitive residential properties nearest to the proposed location of wind turbines. Some of these properties were also relevant for the assessment of the proposed substation and solar array equipment. A representative (rather than exhaustive) selection of assessment properties is detailed in Table 8.1 below and shown on the map of Figure 8.1.

Table 8.1 Assessment properties in the vicinity of the Proposed Development

Property (* denotes a financially involved property)	Easting	Northing	Survey Location
Fforch-dwm Farm*	282101	197216	Fforch-dwm Farm
Pelenna House	281654	196956	Glenview,
Glenview	280732	196236	Railway Terrace
Tonmawr Farm	280779	196284	Glenview,
Railway Terrace	280615	196289	Railway Terrace
Brynhfryd House	280348	196395	Uwch-y-Glyn
Blaenavon Terrace	280092	196520	Uwch-y-Glyn
Uwch-y-Glyn	280077	196765	Uwch-y-Glyn
Blaenafon Farm	280135	196771	Uwch-y-Glyn
Johns Terrace (end)	280039	196802	Uwch-y-Glyn
Tynton	280402	195872	Uwch-y-Glyn
Gyfylchi	281049	195668	Uwch-y-Glyn

- 8.4.4 In addition, following consultation, section 5.7 of Appendix 8.1 considers additional properties located further away from the Proposed Development (such as the nearest properties in Duffryn) and the potential for cumulative noise effects to arise at these more distant properties.
- 8.4.5 The assessment of construction noise has considered the same residential properties as the operational assessment (Table 8.1), as well as dwellings located alongside the proposed routes for access to the Site such as public highways.

Measured baseline data

- 8.4.6 Out of the 30 noise monitoring locations measured as part of the Pen-y-Cymoedd Wind Farm assessment, four properties were considered relevant for the assessment at the properties identified. Table 8.2 identifies, for each assessment location, the survey location from which historical data was referenced to represent the background environment expected to occur in each case.
- 8.4.7 The use of the data in this way is justified by the influence of the different sources of background noise levels identified during a site visit and accounting for comments raised during the consultation by the Local Authority's consultant. This approach is consistent with the guidance provided by ETSU-R-97 and current good practice as set out in the IOA GPG.
- 8.4.8 The historical data was corrected to account for wind shear¹ effects, as detailed in Appendix 8.1. This is because the hub heights of the turbines of the Proposed Development could be between 105 and 125 m, based on the candidate wind turbine considered in this assessment, which is marginally higher than the height of 100 m assumed in the Pen-y-Cymoedd Wind Farm assessment. This correction was applied on a precautionary basis.
- 8.4.9 ETSU-R-97 noise limits were derived for both day-time and night-time periods, applicable to all assessment locations based on the historical survey data. A full description of the ETSU-R-97 assessment methodology is set out in section 3.2 of Technical Appendix 8.1 and the derivation of the ETSU-R-97 noise limits is provided in Section 4.3 of the same document. Tables of the noise limits applicable to the assessment locations are shown in Table 4 and Table 5 of Technical Appendix 8.1 for day-time and night-time periods respectively.

¹ Wind shear is the variation of wind speed with height above the ground.

- 8.4.10 The measured baseline data was also considered in the assessment of operation of the substation and solar array to represent likely background noise levels at the closest assessment locations, consistent with the BS 4142 methodology.

Future Baseline

- 8.4.11 In the absence of the Proposed Development, environmental noise levels in the area are likely to remain largely similar to those currently experienced in the short term, with the exception of any major developments which would affect these levels. See section 8.9 below for implications of Climate Change.

8.5 Inherent Design Mitigation

- 8.5.1 The turbine layout of the Proposed Development has been iteratively developed so as to avoid significant operational noise effects, based on a representative candidate turbine model, whilst maintaining, as far as possible, the generation capacity of the Proposed Development (in addition to other design considerations). This included consideration of the cumulative effects of neighbouring wind farms, where relevant.
- 8.5.2 Specifically, the process involved the calculation of noise emission levels for the scoping layout, and layout design advice was provided on this basis to the design team to demonstrate compliance with the design freeze layout, based on derived ETSU-R-97 noise limits described above, accounting for cumulative effects. The final turbine model to be installed for the Proposed Development would be such that specific derived noise limits can be achieved in practice, as set out in Section 8.7 below.
- 8.5.3 To reduce the potential effects of construction noise, the following good practice measures are proposed:
- Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle (HGV) deliveries to the Site would be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays.
 - Turbine deliveries would only take place outside these times with the prior consent of NPTCBC and the police. Those activities that are unlikely to give rise to noise audible at the Site's boundary will continue outside of the stated hours.
 - All construction activities shall adhere to good practice as set out in BS 5228.
 - 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.
 - 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.
- 8.5.4 The above measures will be implemented as part of the Construction Environment Management Plan (CEMP) which will be secured through a planning condition and include measures to control construction noise as set out above. An Outline CEMP is presented in Appendix 4.1.

8.6 Potential Effects

Construction Phase

- 8.6.1 Predicted noise levels at the closest noise sensitive receptors for each of the key activities during construction of the Proposed Development are presented in Table 6 of Technical Appendix 8.1. Most of the proposed construction activities would generally occur at large distances from the residential properties considered, such that the resulting predicted noise levels would not exceed 45 to 61 dB. With reference to the construction noise criteria set out in Table 1 of Technical Appendix 8.1, the noise impacts from these activities would be considered temporary negligible to minor.
- 8.6.2 Activities associated with road upgrade, cable laying and construction of new site access track 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 along Railway Terrace, and the predicted noise levels are likely to represent those for a very short term period 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 minor magnitude at most.
- 8.6.3 The construction of the new site access to the turbines on Mynydd Blaenafon will however involve more earthwork and therefore a longer works duration, occurring in relatively close proximity to some properties in Tonmawr. For works on building the section of the track within 60 m of Brynhyfryd House, although this is likely to last less than one month, noise levels between 75 to 85 dB(A) could be created. Some activities such as vibratory ground compaction could also create clearly perceptible levels of vibration at Brynhyfryd House, although not at levels likely to lead to any building damage. This could therefore represent a moderate impact according to the relevant criteria detailed in Appendix 8.1.
- 8.6.4 In addition to on-Site activities, construction-related traffic passing to and from the Proposed Development would also represent a potential source of noise to surrounding properties. Reference was made to the traffic assessment presented in Chapter 13: Transport and Access, which presents baseline traffic levels and those predicted during the construction phase. The associated impacts are assessed in detail in Technical Appendix 8.1.
- 8.6.5 The prediction methodology in BS 5288 can be used to predict the noise levels due to heavy vehicles moving on site access routes which currently have limited existing traffic levels (as the CRTN method cannot be applied in these cases). Assuming as a worst-case that all of the construction traffic on Ton-Mawr Road would use the access track to Mynydd Blaenafon, predicted levels at Brynhyfryd House are of less than 53 dB, representing a negligible impact. However, HGV traffic on Fforch-dwm Road is predicted to result in levels of up to 60 dB at properties along this route, which corresponds to a minor impact magnitude.
- 8.6.6 The effect of traffic on other existing roads was assessed using the CRTN methodology, where possible. A maximum increase of 1.5 dB in the day-time average noise level was predicted on Ton-Mawr Road. Based on the criteria set out in the DMRB, this predicted short-term change in traffic noise levels corresponds to a minor impact. For the other roads considered, the predicted increase was of less than 0.5 dB which corresponds to a negligible impact.
- 8.6.7 The construction activities are therefore predicted to result in temporary minor impacts at most for most receptors considered, but with moderate impacts predicted for Brynhyfryd House. As the receptors considered are of high sensitivity, this equates to worst-case temporary moderate effects, which are Significant in EIA terms.

Operational Phase

Wind turbines

- 8.6.8 This operational noise assessment is based upon the noise specifications of the Vestas V150 wind turbine model, with hub heights varying between 105 and 125 metres. The candidate turbines are variable-speed, pitch-regulated machines: as a result, the sound power output of the turbine varies considerably with wind speed, being quieter at the lower wind speeds when the blades are rotating more slowly. The candidate wind turbines have been modelled assuming all operate in their standard and noisiest mode. The modelled layout is specified in Annex B of Appendix 8.1 and illustrated on Figure 8.1.
- 8.6.9 Predictions of operational wind turbine noise for the Proposed Development in isolation at the assessment locations are detailed in Table 9 of Appendix 8.1. These vary between 22-26 dB(A) at low wind speeds and 34-38 dB(A) at high wind speeds for non-involved properties.
- 8.6.10 ETSU-R-97 requires consideration of cumulative noise levels and so the proposed noise levels were added to predictions from the operational Pen y Cymoedd and Fynnon Oer Wind Farms, although the latter was noted to have a negligible effect at the properties considered. The noise produced from the Pen y Cymoedd scheme was considered on a robust basis, with an additional uplift of 2.6 dB added to the emission data for the installed turbines for that site, based on assuming that Pen y Cymoedd just achieves its consent noise limit at the nearest relevant property, Fforch-dwm Farm (see Annex B of Appendix 8.1 for modelling details). This approach is in accordance with consultation and the guidance in the IOA GPG.
- 8.6.11 These cumulative predictions are then compared in Section 5.6 of Appendix 8.1 with the relevant noise limits determined in line with ETSU-R-97. These limits were based in particular on a fixed lower limit of 40 dB(A) for day-time periods, which is consistent with the consent for the Pen y Cymoedd Wind Farm. Section 5.6 of Technical Appendix 8.1 considers that this choice remains applicable in this case 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 wind turbines. This was also agreed as suitable for the assessment as part of the PAC process. Fforch-dwm Farm is an involved property and the lower absolute limit is therefore 45 dB(A).
- 8.6.12 The comparison undertaken confirms that predicted cumulative wind turbine noise levels are compliant with the derived noise limits at all assessment locations of Table 8.1. In addition, a further assessment is presented in section 5.7 of Appendix 8.1, and this confirms that this conclusion remains applicable at more distant properties. For locations in Duffryn (Rhondda), the predicted level from the Proposed Development is of less than 30 dB which is low and negligible in relation to predicted levels from the Foel Trawsnant Wind Farm.
- 8.6.13 Therefore, wind turbine noise from the Proposed Development can remain within the ETSU-R-97 noise limits, and the effect is therefore considered to be Not Significant in EIA terms.

Switching station and solar array

- 8.6.14 The precise choice of equipment which will be used to construct the switching station and solar array will be the result of a future tendering process. Noise from the proposed switchgear equipment, which will be enclosed, is likely to be minimal, although an externally located auxiliary transformer may generate some noise. The solar area will also include two central electrical plant and cooling units which could represent a potential source of noise.
- 8.6.15 Potential worst-case noise levels were estimated based on experience of similar installations and the nearest separation distances with the closest noise-sensitive properties (as set out in Section 5.9 of Technical Appendix 8.1). It is estimated on this basis that noise from plant

associated with the solar and switchgear equipment components of the Proposed Development would not exceed a total 'rated noise level'² of 26 dB at the nearest receptor locations. This accounted for the potential tonal character of this equipment and assuming unobstructed propagation on a worst-case basis.

- 8.6.16 When assessed in line with BS 4142 and in the context of the area and based on the measured baseline background noise levels of around 35 dB (see Appendix 8.1), this would result in a negligible effect which is not significant in EIA terms.

8.7 Additional Mitigation

Construction Phase

- 8.7.1 It is considered feasible to reduce construction noise levels at Brynhyfryd House through measures such as in particular temporary solid screening close to the property boundary. This could reduce noise levels by 10 dB or more if sufficiently high to screen the track construction activities. The details of this mitigation would be finalised as part of the detailed design of the track, following ground investigations. This could be implemented as part of the CEMP, which would also consider measures to minimise the noise produced by the track construction activities. If the residual noise levels at Brynhyfryd House are considered likely to be above 75 dB for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months, noise insulation (or the costs thereof) should be proposed for these residents in advance of the construction.
- 8.7.2 Vibration from construction associated from the work should also be minimised where possible. Engagement with the residents will be undertaken to warn them of the proposed works and that some vibration may be perceptible at times.
- 8.7.3 These measures, including monitoring of noise and vibration levels at Brynhyfryd House during the relevant construction period (see below), will be included in the CEMP and CTMP.

Operational Phase

- 8.7.4 The selection of the final turbine to be installed at the site would therefore be made based on enabling the noise limits of Table 15 of Appendix 8.1 to be 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 Pen y Cymoedd Wind Farm, in line with current good practice. Following the consultation undertaken, the most stringent of the derived specific day-time and night-time noise limits were retained and these would apply at all times.
- 8.7.5 The final plant selection for the solar array equipment should be designed not to exceed a combined rated noise level of 30 dB (when assessed in line with BS 4142) at the nearest receptor locations. This could be secured through a suitably worded condition of the consent. This is considered readily achievable without the need for specific design measures.

² The rated noise level includes a correction for the potential tonal or "humming" character in the noise from the electrical equipment proposed, as a worst-case.

8.8 Residual effects

Construction Phase

- 8.8.1 Following implementation of the mitigation measures described above, the construction activities are predicted to result in temporary minor impacts at most on some highly sensitive receptors (those located in Tonmawr, receptors 2, 3, 5, 6-10 in Figure 8.1), which equate to worst-case temporary minor effects, which are Not Significant in EIA terms.

Operational Phase

- 8.8.2 At some of the closest receptors to the Proposed Development (Table 8.1). locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible, which could represent an adverse effect. At more distant locations, operational noise from the Proposed Development would be very low and less likely to be audible, therefore representing negligible effects.
- 8.8.3 However, in all cases, wind turbine noise from the Proposed Development can remain within the ETSU-R-97 noise limits, and the effect is therefore considered to be Not Significant in EIA terms.
- 8.8.4 With the proposed control of noise from the switching station and solar array, the context of the area and based on the measured baseline background noise levels, when assessed in line with BS 4142 in the context of the area and based on the measured baseline background noise levels, this would result in a negligible effect which is Not Significant in EIA terms.
- 8.8.5 Section 5.9 of Appendix 8.1 considers the potential for in-combination effects from these operational noise sources in combination and based on professional judgement and considering factors such as duration and likelihood of noise exposure, there are unlikely to be any significant additional impacts.

8.9 Implications of Climate Change

- 8.9.1 The climate change projections for Wales, in the 2080s highlight that summer and winter temperatures are likely to be greater than the current baseline (greater for summer), with winter rainfall increasing and summer rainfall decreasing. The background noise survey (described above) has endeavoured to minimise the influence of increased water flow in the current background noise environment, in accordance with ETSU-R-97 and relevant good practice. Accordingly, it is considered the baseline background noise levels would remain representative for the purposes of an ETSU-R-97 assessment when considering the potential effects of climate change.
- 8.9.2 The assessment of plant elements proposed as part of the substation and solar array has considered as a worst-case the possibility that cooling plant may be operating and this therefore takes into consideration the effect of increased temperatures.

8.10 Cumulative effects

- 8.10.1 As noted above and required by ETSU-R-97, cumulative operational noise effects from the turbines when operating alongside the cumulative schemes has been incorporated into the assessment of the Proposed Development set out above.
- 8.10.2 It was concluded that the cumulative operational noise levels at residential properties remain acceptable in line with ETSU-R-97 and therefore, although potentially adverse in some cases, are considered Not Significant in EIA terms.
- 8.10.3 Satisfactory control of cumulative noise immission levels would be achieved through enforcement of the individual consent limits for each of the individual wind farms. For the

Proposed Development, the relevant noise limits are those of Table 15 of Appendix 8.1, which were determined by accounting for the contribution of relevant neighbouring wind farms.

8.11 Grid connection

- 8.11.1 Due to the short-term and localised nature of the construction activities required with the future route, any temporary noise created during construction is likely to be minimal and concentrated in small areas at any one time as the contractor's progress along the course of the route. The construction activities can also be managed in a similar way as described for the Proposed Development in Section 8.5 by restriction on hours of work and good practice measures.
- 8.11.2 Although overhead lines can generate some noise particularly during wet conditions due to corona discharge noise, this will be very limited for a 33 kV capacity line, such that negligible impacts would generally be expected, particularly if close proximity to noise-sensitive properties can be avoided in the final route design.

8.12 Monitoring

- 8.12.1 Monitoring of construction noise and vibration, in consultation with NPTCBC, should be undertaken at Brynhyfryd House for the duration of the site access construction works within 60 m of the property.
- 8.12.2 It is proposed that if consent is granted for the Proposed Development, conditions attached to the consent should include the requirement that, in the event of a noise complaint, noise levels resulting from the operation of the wind turbines on the Site are measured in order to demonstrate compliance with the conditioned noise limits (Table 15 of Appendix 8.1). Such monitoring should be done in full accordance with ETSU-R-97 and include penalties for characteristics of the noise (if present).

8.13 Summary

- 8.13.1 Construction noise has been assessed by a desk-based study of a potential construction programme and by assuming the proposed development is constructed using standard and common methods. Noise levels have been calculated for receiver locations closest to the areas of work and compared with guideline and baseline values. Noise associated with construction traffic has been considered on the basis of relative changes or absolute traffic levels. It is concluded that, following mitigation, noise generated through construction activities would have a minor effect at most, which is Not Significant.
- 8.13.2 Operational wind turbine noise levels have been assessed using the ETSU-R-97 guidelines and relevant good practice, on the basis of new and historical baseline survey data and site-specific considerations. This included consideration of relevant cumulative sites. It was concluded turbines of the type and size which could be installed can operate within the derived ETSU-R-97 limits, even when including consideration of noise from cumulative sites. On this basis, whilst operational wind turbine noise levels may represent an adverse effect at some of the closest receptors, the effects are considered to be Not Significant in EIA terms.
- 8.13.3 Potential noise from the switchgear building and solar array for the Proposed Development was assessed in line with the relevant standard. These would be associated with a negligible effect at most at the nearest highly sensitive receptors, which is Not Significant. The addition of these sources to that of the wind turbines would not affect the outcome of the above assessment and operational noise would remain Not Significant.
- 8.13.4 A summary of the assessment is set out in Table 8.2 overleaf.

Table 8.2 Summary of effects

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Construction Phase					
Most residential properties	Construction noise	Temporary negligible to minor	None.	Negligible to minor	Not Significant
Brynhyfryd House	Construction noise	Temporary moderate	Temporary localised solid screening and measures to minimise site access track construction noise and vibration at Brynhyfryd House. Liaison with closest affected residents and monitoring of levels during relevant construction phase. Noise insulation (or costs thereof) if high residual impacts remain likely.	Temporary minor	Not Significant
Operation Phase					
Residential properties	Operational noise from wind turbines	Acceptable noise levels in line with ETSU-R-97 (adverse or negligible effects).	Selection of final turbine model to meet operational noise limits.	Acceptable noise levels in line with ETSU-R-97 (adverse or negligible effects).	Not Significant
Residential properties	Operational noise from switching station and solar array	Negligible.	None.	Negligible.	Not Significant

8.14 References

Ref 8-1: ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, Final Report for the Department of Trade & Industry, September 1996. The Working Group on Noise from Wind Turbines

Ref 8-2: A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, M. Cand, R. Davis, C. Jordan, M. Hayes, R. Perkins, Institute of Acoustics, May 2013.

Ref 8-3: Control of Pollution Act, Part III, HMSO, 1974.

Ref 8-4: Planning Policy Wales, Edition 11, February 2021.

Ref 8-5: Planning Guidance (Wales), Technical Advice Note (Wales) 11, Noise, 1997.

Ref 8-6: Future Wales: the National Plan 2040, February 2021.

Ref 8-7: BS 5228-1:2009-A:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' and 'Part 2: Vibration'.

Ref 8-8: BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'.

Ref 8-9: Department of Transport (1988). 'Calculation of Road Traffic Noise'.

Ref 8-10: The Highways Agency, Transport Scotland, Transport Wales and The Department for Regional Development (Northern Ireland) (2020). 'Design Manual for Roads and Bridges, LA 111 Noise and vibration', revision 2.

9 Ecology

9.1 Introduction

- 9.1.1 This chapter considers the potential for significant effects on important ecological receptors¹ associated with the construction, operation and decommissioning of the Proposed Development. Within this chapter and assessment, the term 'Proposed Development' includes turbines, ancillary infrastructure, solar array area and area of underground electrical cabling between the turbines and solar array and onsite switching station (as detailed in Chapter 4).
- 9.1.2 The Site is defined by the red line Site boundary shown on Figures 9.1 to 9.7.
- 9.1.3 The c. 7km proposed linear grid connection running south-west between the Site and near the M4 at Briton Ferry (see Figure 4.14) is not included as a component of the Proposed Development as its route is not yet known.
- 9.1.4 A high level appraisal of the potential for effects from a grid connection upon ecological receptors is therefore included separately in section 9.12.
- 9.1.5 The assessment presented within this chapter based on the Guidelines for Ecological Impact Assessment (EclA) in the United Kingdom (CIEEM, 2018ⁱ).
- 9.1.6 The specific objectives of this chapter are to:
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
 - Describe the ecological baseline conditions at the Proposed Development and associated Study Areas, to identify the ecological receptors which will be the focus of this assessment;
 - Evaluate the sensitivity of each ecological receptor;
 - Describe the potential impacts, including direct, indirect and cumulative impacts;
 - Describe the mitigation measures proposed to avoid, reduce and offset potential significant adverse effects; and
 - Assess the significance of residual effects remaining following the implementation of mitigation.
- 9.1.7 The assessment is informed by comprehensive baseline data, including targeted ecological field surveys of important and legally protected ecological receptors identified during desk study and consultation feedback. It draws on pre-existing information, where appropriate, from other studies, survey data sources.
- 9.1.8 This chapter is supported by the following figures:

¹ Note that the term 'ecological receptors' used in this chapter is equivalent to the term 'ecological features' used in the CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018), and can refer to species and/or ecosystems and their functions or services. Receptors is used herein to be consistent with other technical chapters.

- Figure 9.1a: Ecological Statutory Designated Sites
- Figure 9.1b: Ecological Non-statutory Designated Sites
- Figure 9.2 (a-d) – Existing Ecological Records (Non-Sensitive)
- Confidential Figure C9.1 - Existing Ecological Records (Sensitive)
- Figure 9.3 - Phase 1 Habitat Survey Plan
- Figure 9.4 - NVC Survey Plan
- Figure 9.5a – Reptile Survey Plan
- Figure 9.5b – Reptile Survey Results
- Figure 9.5c – Reptile Survey Results
- Figure 9.6 – Bat Survey Plan
- Figure 9.7 – Outline Habitat Management Plan Areas

9.1.9 This chapter is supported by the following technical appendices:

- Technical Appendix 9.1: Habitats
- Technical Appendix 9.2: Protected Species
- Technical Appendix 9.3: Bats
- Technical Appendix 9.4: Outline Draft Habitat Management Principles

9.1.10 Figures and technical appendices, including those of other chapters, are referenced within the text where relevant. Only common names are used within this chapter; scientific names are provided in the technical appendices.

9.1.11 This Chapter complements Chapter 10: Ornithology and Chapter 11: Geology, Hydrology, Hydrogeology. Note that in the interests of concision, information contained in other chapters and appendices is not repeated herein unless essential for understanding and is instead cross referred to within this chapter.

9.2 Legislative, Policy and Guidance

9.2.1 Only legislation and policy with specific relevance to ecological interests are listed in this section; general legislation and planning policy relevant to the proposed development are detailed in Chapter 5: Policy Context.

9.2.2 The following legislation has been taken into account as part of this ecology assessment:

- The Conservation of Habitats and Species Regulations 2017, as amended by the Conservation (Natural Habitats, &c.) (EU Exit) (Amendment) Regulations 2019 (collectively 'the Habitats Regulations'ⁱⁱ);
- The Environment (Wales) Act 2016ⁱⁱⁱ;
- The Wildlife and Countryside Act 1981 (as amended^{iv});
- The Protection of Badgers Act^v;
- Future Wales (2021) - Policy 9 Resilient Ecological Networks and Green Infrastructure;
- Planning Policy Wales 11 (2021) - Chapter 6 Distinctive and Natural Places^{vi}; and,
- Technical Advice Notes 5 (2009) – Nature Conservation and Planning^{vii}.

9.2.3 The following policy has been taken into account as part of this ecology assessment:

- Neath Port Talbot Local Development Plan 2011-2026 (adopted January 2016);
- Neath Port Talbot Biodiversity Duty Plan (2017); and,
- Neath Port Talbot Nature Recovery Action Plan (due for publication in 2021)².

9.2.4 The following key pieces of guidance has been taken into account as part of this ecology assessment:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018ⁱ);
- Countryside Council for Wales (2010) Assessing the Impact of Windfarm Developments on Peatlands in Wales^{viii};
- Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London^{ix};
- Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust (BCT) (2019, updated 2021^x) Bats and Onshore Wind Turbines: Survey Assessment and Mitigation. This document is referred to as the 'Joint Agencies guidance (2021).

9.2.5 Guidance relating solely to survey methods used is contained in Technical Appendices 9.1-9.3.

9.3 Assessment methodology

Scope of Assessment

9.3.1 The assessment presented within this Chapter has been undertaken with reference to CIEEM guidelines (2018) and considers the following potential impacts upon ecological receptors associated with construction, operation and decommissioning of the Proposed Development:

- habitat loss, fragmentation or change as a result of the delivery and installation of development infrastructure; and,
- disturbance, inadvertent killing or injuring of protected or otherwise notable species or inadvertent damage to their breeding sites or resting places.

9.3.2 The potential for significant effects of indirect impacts upon ecological features as a result of the potential spillage and/or migration of pollutants and sediments is considered highly unlikely on the basis of embedded good practice and mitigation measures to be implemented during the construction, operation and decommissioning phases (see Chapter 11, Section 5 and ES Appendix 4.1).

9.3.3 Such measures will be included within a Construction Environmental Management Plan (CEMP) which will be finalised and agreed in consultation with Neath Port Talbot Council (NPTC) and Natural Resources Wales (NRW) on the basis of the Outline Construction Environmental Management Plan (OCEMP), presented as Appendix 4.1.

² <https://www.npt.gov.uk/5405> [accessed December 2021]

- 9.3.4 Potential effects upon ecological receptors are considered as a result of the Proposed Development alone and cumulatively, in-combination with other developments which are the subject of a valid planning application. Operational, under construction and consented wind farm developments with design information in the public domain are considered for the cumulative impact assessment. Developments close to the end of their operational life are included as part of the cumulative assessment to present 'worst case scenario'.
- 9.3.5 CIEEM guidelines (2018) stipulate that it is not necessary to carry out a detailed assessment of impacts upon ecological receptors that are sufficiently widespread, unthreatened and resilient to impacts of the proposed development. As such, the assessment considers effects upon designated sites and ecological receptors which are considered 'important' on the basis of baseline information, relevant guidance, literature, professional judgement of the authors and opinions of statutory advisory bodies provided through consultations in relation to the Proposed Development and, where relevant, other wind farm developments.
- 9.3.6 Where ecological receptors are not considered so important as to warrant a detailed assessment, or where they would not be significantly affected on the basis of baseline information, these are 'scoped out' of the assessment. Mitigation measures for such receptors may, however, still be outlined as appropriate to reduce and/ or avoid any potentially adverse effects or to ensure legislative compliance.
- 9.3.7 The assessment is based on the Proposed Development described in Chapter 4: 'Proposed Scheme Description, Alternatives, Design', and has been undertaken in recognition of design evolution and embedded mitigation measures, as detailed in full within Chapter 4, and standard practices and construction environmental management included within OCEMP, Appendix 4.1.
- 9.3.8 The scope of the assessment has been informed by consultation responses summarised in Table 9.4 and key legislation, policy and guidance.

Predicting effects

- 9.3.9 The assessment has been undertaken with reference to CIEEM guidelines (2018) and includes the following stages:
- determination and evaluation of important ecological receptors;
 - identification and characterisation of impacts;
 - outline of mitigating measures to avoid and reduce significant impacts;
 - assessment of the significance of any residual effects after such measures;
 - identification of appropriate compensation measures to offset significant residual effects; and,
 - identification of opportunities for ecological enhancement.

Criteria for Assessing the Sensitivity of Receptors

- 9.3.10 Relevant European, national and local guidance from governments and specialist organisations has been referred to in order to determine the sensitivity (or importance) of ecological receptors.
- 9.3.11 In addition, importance or sensitivity has also been determined using professional judgement and taking account of the results of baseline field and desk study findings and the functional role of receptors within the context of the geographical area.

- 9.3.12 It should be noted that importance does not necessarily relate to the level of legal protection that a receptor receives, and ecological receptors may be important for a variety of reasons, such as their connectivity to a designated site, rarity or the geographical location of species relative to their known range.
- 9.3.13 For the purposes of this assessment the sensitivity or importance of an ecological receptor is considered in the context of a defined geographical area, ranging from Negligible to High, as detailed in Table 9.1.
- 9.3.14 Effects upon receptors identified as being of Negligible value/sensitivity are not likely to be significant in an EIA context at any geographic scale, and as such are scoped out of detailed assessment within this chapter.

Table 9.1 Value/sensitivity assessment

Receptor value / sensitivity	Receptor type
Very High - International	An internationally designated site i.e. Special Area of Conservation (SAC) or candidate/potential site (pSAC). Large areas of priority habitat listed under Annex 1 of the Habitats Directive, and smaller areas of such a habitat that are essential to maintain the viability of that ecological resource. A regularly occurring, nationally significant population of any internationally important species, listed under Annex II or Annex IV of the Habitats Directive ³ .
High - National	A nationally designated site e.g. Site of Special Scientific Interest (SSSI), or area meeting criteria for national level designations. Significant extents of a priority habitat identified in Section 7 of the Environment (Wales) Act 2016 (S7), or smaller areas which are essential to maintain the viability of that ecological resource. A regularly occurring, regionally significant population of any nationally important species listed as a S7 priority species and species listed under Schedule 1 or Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) or Annex II or Annex IV of the Habitats Directive.
Medium - Regional	Viable areas of key semi-natural habitat identified in the UK Biodiversity Action Plan (UKBAP). A regularly occurring, locally significant population of any nationally important S7 species and species listed under Schedule 5 of the Wildlife and Countryside Act or Annex II or Annex IV of the Habitats Directive. Sites which exceed the local authority-level designations but fall short of SSSI selection guidelines, including extensive areas of semi-natural woodland.
Low - Local	Species and habitats of local conservation importance, specifically those listed by the Neath Port Talbot Biodiversity Duty Plan (BDP). Areas of habitat or species considered to appreciably enrich the ecological resource within the local context (e.g., species-rich flushes or hedgerows). All other species and habitats that are widespread and common and which are not present in locally, regionally or nationally important

³ Council Directive 92/43/EEC of 21st May 1992 on the conservation of natural habitats and of wild fauna and flora.

Receptor value / sensitivity	Receptor type
	numbers or habitats which are considered to be of poor ecological value.
Negligible	All other species and habitats that are widespread and common and which are not present in regionally, nationally or locally important numbers.

Criteria for Assessing the Magnitude of Change

9.3.15 Once identified, potential effects are described making reference to the following characteristics as appropriate:

- Adverse or beneficial;
- Extent;
- Magnitude;
- Duration;
- Timing;
- Frequency; and
- Reversibility.

9.3.16 The assessment only makes reference to those characteristics relevant to understanding the nature of an effect and determining its significance. For the purposes of this assessment the temporal nature of potential effects are described where appropriate as follows:

- Negligible: of inconsequential duration;
- Short-term: for 1-5 years;
- Medium-term: for 5-10 years;
- Long-term: >10-30 years; and
- Permanent: >30 years.

9.3.17 The criteria used to determine the magnitude of effects are set out in Table 9.2.

9.3.18 It is important to note that, where reference is made to population level effects to assess magnitude the most recently published available population estimates used are considered to be guides.

9.3.19 In addition, it will often be impossible to equate an impact to an actual population loss. For example, where protected species may be displaced from a wind farm site as a result of construction or operational activities, such a loss may be temporary or may reasonably result in the relocation of species to suitable habitats elsewhere within the site, immediate or wider area. Where uncertainty arises a precautionary approach has been adopted.

9.3.20 As such, professional judgement, on the basis of best available evidence, has been used to inform the assessment presented within this chapter.

Table 9.2 Magnitude of impact

Magnitude	Description
Very High	The impact (either on its own or in-combination with other proposals) may result in the permanent total or almost complete loss of a site and/ or species status or productivity.
High	The impact (either on its own or in-combination with other proposals) may adversely affect the conservation status of a site and/ or species population, in terms of the coherence of its ecological structure and function (integrity), across its whole area, that enables it to sustain the habitat, complex of habitats and/ or the population levels of species of interest.
Medium	The impact (either on its own or in-combination with other proposals) would not adversely affect the conservation status of a site and/ or species, but some element of the functioning might be affected and impacts could potentially affect its ability to sustain some part of itself in the long term.
Low	Neither the above or below applies, but some observable adverse effect is evident on a temporary basis or affects extent of habitat/species abundance in the local area.
Negligible	A very slight (indiscernible) reduction in a site and/ or species status or productivity and/ or no observable impact.

Criteria for Assessing Significance

9.3.21 CIEEM guidelines (2018) note that:

"A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects have been lawfully permitted following EIA procedures."

9.3.22 For the purposes of this assessment significant effects are therefore identified as those which encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

9.3.23 Such effects are identified by considering the importance of a receptor, the magnitude of the effect and applying professional judgement based on best available evidence, to identify whether the integrity of a receptor would be affected.

9.3.24 The term 'integrity' is used here to refer to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

9.3.25 For the purposes of this assessment, significant effects are primarily expressed with reference to an appropriate geographical scale, and are based on Welsh population estimates where these are available, and where available regional estimates provide sufficient information to allow a meaningful assessment.

9.3.26 In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed as a precautionary approach. Where uncertainty exists, this is acknowledged.

9.3.27 Where the assessment proposes measures to mitigate potentially significant adverse effects on ecological receptors, a further assessment of residual effects, taking into account such measures, has been undertaken.

9.3.28 CIEEM guidelines (2018) do not recommend the sole use of a matrix table as commonly set out in ES Chapters to determine 'significant' and 'non-significant' effects. For the purposes of the assessment presented herein, Table 9.3 sets out adapted CIEEM terminology and equivalent in the context of the EIA Regulations, which has been used within this chapter.

9.3.29 Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 9.3 Significance of effect

Significance	Definition	
Significant	Major Adverse/Beneficial	A medium or high, medium or long-term adverse or beneficial effect upon the integrity of an ecological receptor of High value.
	Moderate Adverse/Beneficial	A high or very high, long-term or permanent adverse or beneficial effect upon the integrity of an ecological receptor of Medium/High value.
Non-significant	Minor Adverse/Beneficial	A low or medium, short-term or long-term adverse or beneficial effect upon the integrity of an ecological receptor of Low/Medium value.
	Negligible/Beneficial	A negligible or low adverse or beneficial effect upon the integrity of an ecological receptor of Low/Negligible value.

Requirements for Avoidance, Mitigation, Compensation and Enhancement

9.3.30 The mitigation hierarchy has been adopted to avoid, mitigate and compensate for potentially adverse effects upon ecological receptors as a result of the Proposed Development:

- Avoidance is used where an impact has been avoided or minimised e.g., through changes in Proposed Development design;
- Mitigation is used to refer to measures to reduce or remedy a specific adverse impact in situ;
- Compensation describes measures taken to offset residual effects, i.e., where mitigation in situ is not possible; and
- Enhancement is the provision of new benefits for biodiversity that are additional to those provided as part of mitigation or compensation measures, although they can be complementary.

9.3.31 Note that in this chapter these are referred to collectively as 'mitigation' for brevity when discussing generalities, though with the form of mitigation specified as appropriate in discussion of any specific requirements

Criteria for Assessing Cumulative Effects

9.3.32 In the absence of specific guidance for Wales, cumulative impacts have been assessed with reference to NatureScot guidance (2012^{xi} and 2021^{xii}) for important ecological receptors subject to a detailed assessment and Joint Agencies guidance (2021) in relation to bats.

- 9.3.33 For (non-avian) species potentially significant cumulative effects are only likely where other developments are located within the regular range of more mobile species (e.g., bats). Cumulative impacts have therefore been assessed with reference to Joint Agencies guidance (2021) for bats only, in-combination with other relevant developments located within 10km of the Proposed Development site (see Figure 4.1).
- 9.3.34 Cumulative effects are only considered for effects of above negligible magnitude, as it is considered that negligible residual impacts would not likely contribute measurably to significant cumulative effects.
- 9.3.35 The cumulative assessment includes consideration of:
- Existing wind farm developments, either operational or under construction;
 - Consented wind farm developments, awaiting implementation; and,
 - Wind farm applications awaiting determination within the planning process with design information in the public domain.
- 9.3.36 Non-wind farm developments identified within 10km of the Proposed Development site (see Figure 4.1), are not considered likely to contribute to potentially significant operational collision mortality risks to bat and as such have been scoped out of subsequent assessment.
- 9.3.37 Those developments which have been withdrawn and/or refused are not considered, unless an appeal is currently in progress and information is available. Furthermore, those developments at the EIA screening stage are not considered as no information relevant to the cumulative effects is available for these projects.
- 9.3.38 Whilst single or small-scale wind turbine developments may contribute to cumulative effects, these have been scoped out of inclusion for potentially significant cumulative effects as applications for such developments do not generally consider the potential for impacts upon ecological receptors in sufficient detail to enable meaningful assessment.

Consultation

- 9.3.39 Table 9.4 summarises the consultation responses received regarding ecology and provides information on where and/ or how they have been addressed in this assessment. To avoid repetition, information contained elsewhere in the chapter is only briefly summarised in Table 9.4, with cross references given to where in the chapter further information is provided.

Table 9.4 Consultation Responses

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
Neath Port Talbot County Borough Council (NPTCBC) (30th May 2022)	Scoping	Queried why reptile surveys have not been updated, and carried out within the whole Site.	Updated reptile surveys have been undertaken within the Site in August and September 2022. Full details are presented within Technical Appendix 9.2.
		Noted that the scoping report did not include the solar array and that therefore the Authority is unable to give a	The location of the solar array is

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		scoping opinion of what surveys are needed to appropriately assess the impacts.	shown on Figure 4.1, with a detailed description presented in Chapter 4. The scope of baseline ecological surveys to inform an assessment of this component of Proposed Development has been determined based on extensive experience of the assessment of proposed solar developments in similar habitats and in Wales, and with reference to appropriate literature in the absence of specific guidance for Wales (incl. Taylor et al. 2019 ^{xiii}). Details of baseline survey methods are included in Technical Appendix 9.1-9.3. Discussion of habitats in the location of the solar array, and an assessment of potentially significant effects upon ecological receptors is included within this Chapter.
		Provided contact details for Vattenfall to request bat data for Pen Y Cymoedd Wind Farm.	Noted, data requested and received from Vattenfall for the Pen y Cymoedd Wind Farm has been used to inform the assessment where appropriate within this Chapter. Further details are presented within Technical Appendix 9.3.

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		Requested that the grid connection, access corridor, 20ha solar farm array and the wind farm (as well as associated infrastructure), are considered as a whole to assess the cumulative impact of the proposed development.	All known wind and solar farm infrastructure are included in the Proposed Development for the purposes of assessing the cumulative impact of the Proposed Development. The grid connection route is not currently determined and so detailed consideration of this element is not possible. However, works associated with the grid connection will be minimally invasive and temporary, and subject to good practice mitigation measures, and so any impacts will be highly localised and short-term and not likely to be significant in the context of EIA. Further discussion of the grid route is included at the end of this Chapter.
Natural Resources Wales (NRW) (20th May 2022 & 7th July 2022)	Scoping	Advised that targeted species surveys should be undertaken by suitably qualified and experienced ecologists, in accordance with current best practice guidelines, for all species scoped into the assessment. Deviations from guidance should be acknowledged and justified in the ES.	All surveys have been undertaken by appropriately qualified and experienced surveyors, in accordance with current guidance (see Technical Appendices 9.1-9.3). Any limitations to survey, including deviations from guidance, are discussed within this Chapter and within Technical Appendices 9.1-9.3.

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		Stated they largely agree with the scoping report regarding the protected species to be scoped in/out.	Noted.
		Advised that any trees requiring felling or pruning should be subject to surveys to assess their potential to support roosting bats. Any deemed to have potential to support roosting bats should be subject to climbed, endoscope surveys to further assess potential roost features for the presence of bats.	No felling or pruning of any trees with the potential to support bat roosts is included in the Proposed Development or expected to be required. In the event works to trees or other structures capable of supporting roosts are required measures to be implemented to ensure the protection of roosting bats, including pre-commencement surveys will be detailed in the CEMP. An OCEMP is presented in Technical Appendix 4.1.
		Advised that impact assessment should consider species-specific impacts to current conservation status (CCS) and maintenance of favourable conservation status (FCS) in the short, medium and long term together with any mitigation and compensation measures proposed to offset the impacts identified for any protected species recorded during the surveys.	Assessment of impacts during construction, operation and decommissioning to protected species identified during surveys is included within this Chapter where it is considered there is potential for significant effects. Measures where required to address significance or adverse effects and/or to ensure legislative compliance are detailed within this Chapter and within the OCEMP presented as Technical Appendix 4.1.

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		Advised that the ES sets out how the long-term site security of any mitigation or compensation will be assured, including management and monitoring information and long term financial and management responsibility. Where the potential for significant impacts on protected species is identified, they recommended that a Conservation Plan is prepared for the relevant species and included as an Annex to the ES.	An OHMP and OCEMP containing outline principles to provide mitigation and enhancements, including management and monitoring, are included as part of the ES as Technical Appendix 9.4 and 4.1 and referenced within this chapter where relevant. It is expected that the details of the HMP and CEMP will be agreed with NRW and NPTCBC, and secured by an appropriate planning condition. Note, the biodiversity net benefits of the measures are summarised in Section 9.10.
		Stated that where the Proposed Development may contravene legal protections in respect of European Protected Species, a licence should be sought from NRW in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended).	Noted. Measures to ensure the protection of European Protected Species will be provided within the CEMP, including pre-commencement surveys and protocols for determining the requirement for, and where required applying for, a licence from NRW.
		Advised that where proposals implicate protected species which are also notified features of designated sites (e.g. Special Areas of Conservation (SAC), Site of Special Scientific Interest (SSSI)), the ES should consider the impacts on those species from both perspectives	The potential for connectivity between the Site and designated sites has been considered on the basis of the Zone of Influence of the Proposed Development and depending upon the

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			nature of such sites qualifying interests. On this basis, the proposed development is not considered to have potential for connectivity with any statutory designated site. The potential for impacts to the three SINCs within a Zol of the Site, and their notified features (where relevant), is considered within this Chapter.
		Advised that the ES 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.	In accordance with CIEEM guidelines (2018) and the principles of proportionate EIA, detailed assessment of the likely impacts is reserved for those features for which the potential for significant impacts to their populations as a result of the Proposed Development exists at a defined geographic scale. Embedded mitigation and standard good practice measures with a proven track record for minimising or preventing adverse impacts are embedded in the Proposed Development, and the likelihood for significant effects is determined taking account of these measures. Receptors which are highly unlikely

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			to be subject to significant effects of the proposed development are scoped out of detailed assessment with rationale and justification provided.
		Advised that habitat surveys should accord with the NCC Phase 1 survey guidelines (NCC (1990) Handbook for Phase 1 habitat survey. NCC, Peterborough) and be undertaken at an appropriate time of year.	Phase 1 surveys were carried out in accordance with current JNCC Phase 1 survey guidance (2010) and which supersedes NCC guidance. Survey methods are detailed in Technical Appendix 9.1 and summarised within this chapter.
		Recommended that the Local Authority Planning (LPA) Ecologist be consulted to ensure that regional and local biodiversity issues are adequately considered, particularly those habitats and species listed in the relevant Local Biodiversity Action Plan (LBAP) and are that are considered important for the conservation of biological diversity in Wales.	NPTCBC have been consulted on the Proposed Development via the formal scoping process, and via ongoing liaison between the Applicant and the NPTCBC Ecologist.
		Recommended consultation with e.g. the relevant Local Records Centre and any local ecological interest groups (e.g. bat groups, mammal groups) to obtain ecological data for the Zol of the Site.	A desk study has been carried out to inform the assessment and where relevant assist in the interpretation of field survey findings; desk study methods and records are detailed in Technical Appendix 9.2 and are summarised in this chapter where relevant.
		Advised that the development should avoid removal or fragmentation of narrow green infrastructure corridors in the Site and incorporate robust green infrastructure that will remain unlit to allow protected species to continue to inhabit the site and move through it.	No narrow green infrastructure corridors will be affected by the Proposed

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			Development. Proposals within the OHMP will serve to provide additional green infrastructure and improve habitat connectivity around the Proposed Development in the longer term. Note, the biodiversity net benefits of the measures are summarised in Section 9.10.
		Advised that the application should demonstrate how it can deliver biodiversity enhancements and thus contribute to promoting ecological resilience.	The Proposed Development will include for a HMP which will be finalised in consultation with NRW and NPTCBC on the basis of the OHMP included as Technical Appendix 9.4. The HMP will include for those measures to mitigate effects and deliver demonstrable biodiversity enhancements in accordance with this advice. Note, the biodiversity net benefits of the measures are summarised in Section 9.10.
Planning and Environment Decisions Wales (PEDW) (24th June 2022)	Scoping	Advised that as desk-study records had not been included in the Scoping Report, they could not comment on the likely importance of the Site for invertebrates, notable flora, amphibians and other species, and recommended that this information is provided to evidence justification for excluding them from assessment.	Desk study records are provided in Technical Appendix 9.2 and associated figures and are discussed within this Chapter. Justification for inclusion or exclusion of ecological receptors from detailed assessment is also

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			provided within this chapter.
		Queried why reptile surveys have not been updated, and carried out within the whole Site.	Updated reptile surveys were undertaken within the whole Site in August and September 2022. Full details are provided in Technical Appendix 9.2.
		Queried the bat survey methods, and requested clarification as to whether up to date bat survey guidance was followed.	Baseline bat activity surveys have followed Joint Agencies guidance (2019, updated 2021) "Bats and onshore wind turbines - survey, assessment and mitigation". Full details of survey methods used are provided in Technical Appendix 9.3.
		Queried the classification of site-risk for bats as information to support this classification was not included in the Scoping Report.	The site risk has been classified in accordance with current Joint Agencies guidance (2021); see Technical Appendix 9.3. To avoid unnecessary repetition, detailed information regarding bats was not included in the Scoping Report as they have been scoped into the ES, and so all relevant information to inform assessment is presented in this Chapter and Technical Appendix 9.3.
		Queried whether the presence of waterbodies (including ponds) within 500 m of the proposed solar arrays and within 250 m of the grid corridor has been considered, and stated that amphibians cannot be scoped out at this stage.	There are no suitable waterbodies within 500 m of the proposed solar arrays. The exact

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			grid connection route is not yet known. When the grid connection route is determined, and prior to any works commencing, pre-construction protected species surveys will be carried out within an appropriate buffer of the route, with species-specific mitigation implemented based on survey results. Works associated with the grid connection will be minimally invasive and temporary, and subject to good practice mitigation measures, and so any impacts will be highly localised and short-term. Further discussion of the grid route is provided at the end of this chapter.
		Queried that Paragraph 8.31 of the Scoping Report states that "There are some species groups which, providing the implementation of suitable mitigation measures, are unlikely to be subject to significant effects as a result of wind farm developments" and requested substantiation/clarification re consideration of the solar element. They consider that impacts of the solar element on invertebrates have not been considered.	On the basis of current guidance referred to herein, it is considered that providing the implementation of suitable mitigation measures provisioned for as part of the Proposed Development, the potential for significant effects upon certain species groups is very unlikely. In response to comments provided, consideration of the potential for significant effects upon invertebrates

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			in relation to the solar element of the Proposed Development is provided within this chapter.
		Noted that vegetation supported by peaty soils is present on site and requested consideration of peat in terms of ecological impacts as well as hydrogeological / geological considerations. The ES should cross reference as necessary and be produced in an integrated fashion.	Potential impacts to peatland habitats are considered in Section 11.6, and in the OHMP (Technical Appendix 9.4). Where relevant, this chapter cross-references other chapters of the ES, including Hydrology and Ornithology. Note, the biodiversity net benefits of the measures are summarised in Section 9.10.
		Requested clarification of Paragraph 8.48 of the Scoping Report re the statement that in the cumulative impact assessment, sensitive receptors will be limited to the same hydrological catchment(s). Advised that this is not considered appropriate as there are sensitive receptors based outside of the hydrological catchment area that the ES needs to take into account.	Paragraph 8.48 states that the potential for cumulative effects on ecological features with other wind farm proposals "will be.../... restricted to those developments located within the same hydrological catchment(s) or within the known range of mobile species (e.g. bats up to 10km). " It is considered appropriate to limit consideration of potentially significant cumulative effects to habitats or to relatively static species to the same hydrological catchment, as without hydrological connectivity there

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			are limited or an absence of potential pathways for in-combination effects. Further details are provided within this chapter.
		Advised that the ES should include a detailed ecological management and monitoring plan, including targets and enhancement objectives specific to the habitats and species present on site. This should include post-construction monitoring, in accordance with guidance, for bats and indicate triggers which would prompt changes in the management of the site. Net benefits should be clearly identified.	The Proposed Development will include for a HMP, based on the OHMP included as Technical Appendix 9.4. The HMP once finalised will mitigate effects and deliver biodiversity enhancements, including management and monitoring requirements determined based on consultation with NRW and NPTCBC. Further liaison with stakeholders, including in relation to the operational monitoring and dynamic management strategy, is included in the OHMP, and it is proposed that the finalisation of the HMP, in consultation with NPTCBC and NRW, would be completed prior to the end of the first year of operation of the Proposed Development. Further details are provided in Technical Appendix 9.4. Note, the biodiversity net benefits of the measures are summarised in Section 9.10.

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
NRW (23rd January 2023)	Pre-Application Consultation	Stated that considerable investment has been spent on improving fish passage and habitat connectivity within the Pelenna Catchment, including the bridge at Fforch Dwm. Considered that although not opposed to elements of the current bridge at Fforch Dwm being removed for the purpose of access for the Proposed Development, stated that it would need to be replaced with a 'free span' bridge rather than box culverts and elements of the 'nature like' fishway should remain in situ in order to stabilise the whole river reach. Advised that liaison should be undertaken with the NRW fisheries team to discuss bridge design.	The design of the replacement bridge has been sensitive to allow the continued free passage of fish at Fforch Dwm. The design of the bridge is summarised in Chapter 4 and illustrated in Figure 4.12. Information is also provided in Section 9.5. It will be a free span permanent structure, with the southern span only temporary and will be removed after construction of the Proposed Development is complete. It is proposed that consultation with the NRW fisheries team is undertaken to ensure that NRW are satisfied with the design and function of the replacement bridge particularly in terms of allowing the continued free passage of fish (and other wildlife).
		Welcomed information regarding ecology surveys that have been undertaken. Confirmed they are satisfied that the locations surveyed during bat activity surveys are representation of the habitats at the proposed turbine locations. Welcomed the bat buffers (at least 50m) between proposed turbines and nearest bat habitat features. Recommended that post-construction bat activity monitoring is undertaken from outset of the operational phase to assess any changes (especially increases) in bat activity by medium/high-risk species, such that the level of risk posed to these species increases above the currently assessed low risk, and whether turbine curtailment may be needed.	Noted. Noted (detailed in Section 9.5). A commitment for post-construction bat monitoring is made in Section 9.12. Noted.

Consultation and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		We concur that curtailment is not needed from outset of the operation of the Proposed Development, but remains an option if monitoring detects an increase in the risk posed to more sensitive species. Noted that feathering all turbine blades whilst idling is part of proposal and welcomed this. Recommended that specifics of when idling will apply should be stated. Consider that the above bat recommendations (turbine siting, turbine blade feathering and post-construction bat monitoring) can all be managed through the use of appropriately worded conditions attached to any permission granted by PEDW for the Proposed Development.	Noted. Information regarding feathering blades is provided in Section 9.11. Details into when idling will be applied will be agreed if consented. Noted, and agree to this commitment.

Assumption and Limitations

- 9.3.40 The potential for limitations to assessment to arise from baseline studies are discussed in full within Appendices 9.1-9.3. It is concluded that there are no limitations to subsequent assessment.

Ecobat Tool

- 9.3.41 The Ecobat tool remains in its relative infancy, and naturally there is the possibility of having limited data in the reference range, reducing the confidence in the assigned category. The tool does, however, provide a guide for discussion along with Site-specific circumstances (e.g., habitats present, desk study information) and its use is advised in accordance with Joint Agencies guidance (2021).
- 9.3.42 The data within the reference range used to compare activity levels between the Proposed Development data and other records within the region of Neath Port Talbot is likely to have been obtained from surveys undertaken at proposed or operational wind farm sites, and so from relatively low value habitats.
- 9.3.43 When data are entered into Ecobat for analysis, there is no allowance for entering recording nights where no bat passes were recorded, and so the analysis is carried out only on presence data. This can act to skew the results and elevate the risk levels of percentile ranks calculated.

- 9.3.44 Ecobat output is therefore regarded as an indicative assessment and to be considered alongside desk study information and professional judgement, rather than conclusive evidence of the importance of a site for bats.

9.4 Baseline conditions

Current Baseline

- 9.4.1 This section provides a summary of baseline ecological condition including an overview of the known distribution of habitats and protected species and designated sites in proximity to the Proposed Development.

Desk study

Designated sites

- 9.4.2 Designated sites identified in proximity to the Proposed Development are detailed in Technical Appendix 9.1.
- 9.4.3 The potential for effects upon statutory designated sites, designated solely for habitat interests and located greater than 5km from the Site are scoped out of assessment on the basis of spatial separation and absence of potential for impact pathways.
- 9.4.4 There are two Local Nature Reserves (LNRs) located within 5 km of the Site:
- Bryn Tip (3.78km south) - A former colliery site now containing dry species rich grasslands which support rare and protected species of plants, invertebrates, birds and mammals; and,
 - Eaglesbush Valley (4.57km west) - notified for oak woodland valley interests.
- 9.4.5 There is no direct hydrological connectivity between the Site and these LNRs. There are also topographical, forestry, hydrological and anthropogenic built habitat barriers between the Site and the LNRs. On account of spatial separation, absence of hydrological connectivity and existing barriers, no potential pathways for effects upon the qualifying interests of the LNRs are identified. The potential for effects upon LNRs are therefore scoped out of assessment.
- 9.4.6 There are three Sites of Importance for Nature Conservation (SINCs) within a Zone of Influence (Zoi) of the Site (see Figure 9.1b):
- Tyle'r Waun - located within the east of the Site; qualifying features are blanket bog and reptiles (Figure 9.7);
 - Cwm Blaenpelenna - adjoins part of the northern Site boundary; qualifying features are mosaic habitats, open mosaic on previously developed land (ex-colliery site) and invertebrates (nine species of conservation importance) (Figure 9.7); and,
 - Tonmawr Minewater Treatment & Surrounding Habitats - adjacent to the western Site boundary; qualifying features are structurally diverse and species-rich scrub communities, lowland heathland, reedbeds and herptiles.
- 9.4.7 Tyle'r Waun SINC comprises modified blanket bog, valley mire, marshy grassland and acid grassland. Sheep-grazing and suspected burning have reduced dwarf shrub cover.

9.4.8 Cwm Blaenpelenna SINC is a former colliery site now supporting a diversity of habitats including dry heathland, dry grassland, wetland, scrub and secondary woodland. In 2017 an intensive invertebrate study was done by the Colliery Spoil Biodiversity Initiative finding 134 invertebrate species; nine of which are species of conservation importance. The condition of habitats is noted affected by scrub/tree encroachment which is reducing the extent of open habitat, with management needed to halt the decline.

9.4.9 Tonmawr Minewater Treatment & Surrounding Habitats SINC is an area of lichen heath and acid grassland, which is recorded in the selection notification as having many species of reptile present in notable numbers. The wetlands were constructed in the late 1990s to treat the most contaminated minewater discharges affecting the Pelenna valley and lower the dissolved iron concentration in the river. The SINC is noted to be affected by scrub/tree encroachment which is threatening the grassland and heathland, with scrub control highlighted as being needed.

Protected/Notable Species

9.4.10 Existing records of protected and notable species obtained from the South East Wales Biodiversity Records Centre (SEWBRc) are shown on Figures 9.2a-d and Figure C9.1, and further detailed in Technical Appendices 9.1 and 9.2.

9.4.11 In summary, existing records obtained from within the Site⁴ by the SEWBRc from between 2012 to 2022 included records of:

- Eleven protected/sensitive plant and liverwort species, many of which are associated with the Tyle'r Waun and Cwm Blaenpelenna SINC;
- Three invasive/non-native plant species;
- Two reptile species; and,
- Twenty-three invertebrate species.

9.4.12 There were no existing records of protected terrestrial mammal species returned from within the Site in the last 10 years and no bat records returned from within 1km of the Proposed Development.

9.4.13 A review of post-construction monitoring reports of the adjacent Pen y Cymoedd wind farm confirms the known presence of the following bat species within proximity to the Proposed Development:

- Greater horseshoe bat;
- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle;
- Myotis species;
- Noctule;
- Leisler's bat;

⁴ Note that all plant and terrestrial mammal records returned by SEWBRc, and several of the invertebrate and amphibian records, are at a 1km grid square resolution and therefore locations of desk study records are considered indicative of habitat and species assemblages.

- Serotine;
- Plecotus species; and,
- Barbastelle.

Field surveys

- 9.4.14 Full details of methods and results for baseline surveys are provided within Figures 9.3-9.6 and Appendices 9.1-9.3.
- 9.4.15 The scope for field surveys was determined through a review of Key Sources specified in the EIA Scoping Report (see Appendices 9.1-9.3), and via the EIA Scoping exercise.
- 9.4.16 The following baseline ecological field surveys have therefore been completed within the Proposed Development site to confirm the presence and distribution of ecological receptors:
- Phase 1 Habitat survey;
 - National Vegetation Classification (NVC) survey;
 - Terrestrial mammal searches;
 - Bat activity survey; and
 - Reptile survey.
- 9.4.17 Ecological field surveys were previously undertaken in 2015 to inform the design and assessment of a preliminary wind farm layout (located within the MFD section only) and so where appropriate, e.g. for relatively static receptors such as habitats, surveys undertaken subsequently have sought to validate and where necessary update the results of these previous surveys.
- 9.4.18 Updated surveys have been conducted for bats to reflect the mobile and sensitive nature of this receptor, and the changes to industry guidance that have occurred since the previous surveys were completed.
- 9.4.19 Baseline data collected in 2015 provides useful contextual information and has been referred to, to support assessment conclusions where appropriate.

Phase 1 Habitat Survey

- 9.4.20 A Phase 1 habitat survey was undertaken within the Site in 2015, the results of which were validated and updated in 2019, 2021 and 2022, in response to scheme design and extensions to the Site.
- 9.4.21 All surveys have been undertaken in accordance with the UK industry standard Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Methodology (JNCC, 2010)^{xiv} by suitably competent and experienced ecologists.
- 9.4.22 The Site predominantly comprises semi-improved (species-poor) acid grassland (B1.2) and semi-improved neutral grassland (B2.2), with marshy grassland (B5) common in the west and east of the Site. There are a number of areas of continuous bracken (C1.1) and scattered scrub (A2.2)/continuous bracken (C1.1) in the west of the Site.
- 9.4.23 Woodland habitats are limited in extent in the Site, with blocks of semi-natural broad-leaved woodland (A1.1.1), coniferous semi-natural woodland (A1.2.1) coniferous plantation woodland (A1.2.2) and mixed (semi-natural) woodland (A1.3.1) principally associated with the Fforch-dwm Farm in the east of the Site. Coniferous plantation woodland (with areas of recently felled coniferous woodland, A4.2) is the main habitat surrounding the Site.

- 9.4.24 The Tyle'r Waun SINC in the east of the Site comprises principally of marshy grassland (B5) and semi-improved acid grassland (B1.2), with an area of wet modified bog (E1.7) and isolated acid/neutral flushes (E2.1).
- 9.4.25 The main watercourses within the Site comprise the Nant y Cywion in the east of the Site (which flows through the Tyle'r Waun SINC), Nant Cwm-y-pant which flows close to the Fforch-dwm Farm, Nant Blaenpelenna which flows along part of the northern and western Site boundary (MFD area), and a short stretch of the Nant Blaengweffrwd in the north-west of the Site. There is also a drainage ditch/un-named watercourse in the west of the Site.
- 9.4.26 Adjacent to the Site in the south are a series of man-made waterbodies used for filtering out contaminated mine-water before it flows into the Nant Blaenpelenna. There are also a series of mine-water treatment waterbodies within the Tonmawr Minewater Treatment & Surrounding Habitats SINC to the west of the Site, separated from the Site by a road network.
- 9.4.27 Two areas of Himalayan balsam were recorded within the Site, as shown on Figure 9.3 as TN1 and TN2.
- 9.4.28 No other protected or notable plant species were recorded within the survey area
- 9.4.29 Full details are provided in Technical Appendix 9.1.
- 9.4.30 The grid connection route is not yet fully determined but an initial appraisal of habitats using aerial imagery and ground-truthing from public rights of way, was undertaken to further inform route selection in 2021. Habitats along the proposed route corridor (shown in Figure 4.14) were observed to primarily comprise pasture fields, intersected by hedgerows and treelines, with areas of mixed, broad-leaved and coniferous woodland.

Terrestrial mammal searches

- 9.4.31 Phase 1 Habitat surveys carried out at the Site were extended to identify the presence or assess the potential for habitats present to support protected and priority species, in accordance with CIEEM guidance (2017a^{xv} and 2017b^{xvi}). Full details are provided in Technical Appendix 9.2.
- 9.4.32 With the exception of low potential for foraging badger, no evidence of, or suitable habitat for, any protected terrestrial mammal species was recorded during any of the surveys carried out at the Site.

National Vegetation Classification (NVC)

- 9.4.33 An NVC survey was undertaken within the Site in 2015, the results of which were validated and updated in 2021, in response to scheme design and extensions to the Site.
- 9.4.34 Surveys were undertaken with reference to Rodwell (2006)^{xvii} and by suitably competent and experienced ecologists.
- 9.4.35 Due to the absence of protected or notable habitats recorded during the Phase 1 habitat survey, NVC surveys were not carried out along the proposed access track between the eastern (MFD) and western (MB) areas of the Site, or along the potential grid route investigation area.
- 9.4.36 A summary of the potentially notable habitat communities identified within the Site is provided in Table 9.5.

Table 9.5 Summary of Vegetation Communities

NVC community	Principal corresponding Habitats Directive Annex I type/s	Corresponding Priority habitat on the Section 7 of the Environment (Wales) Act 2016	Potential dependence of community/ habitat on groundwater* 1=High, 2=Moderate, 3=Low
M23b <i>Juncus effusus</i> - <i>Galium palustre</i> rush - pasture with <i>Juncus effusus</i> sub-community	None directly applies	Purple moor-grass and rush pastures	1 (where not on deep peat)
M25a <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire: <i>Erica tetralix</i> sub-community	Molinia meadows on calcareous, peaty or clayey silt-laden soils (Molinion caeruleae)	Purple moor-grass and rush pastures	2 (where not on deep peat) 3 (if on deep peat)
M25b <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire: <i>Anthoxanthum odoratum</i> sub-community	Molinia meadows on calcareous, peaty or clayey silt-laden soils (Molinion caeruleae)	Purple moor-grass and rush pastures	2 (where not on deep peat) 3 (if on deep peat)
M20 <i>Eriophorum vaginatum</i> blanket bog	Blanket bog	Blanket bog	3
M6b <i>Carex echinata</i> - <i>Sphagnum fallax</i> mire <i>Carex nigra</i> - <i>Nardus stricta</i> sub-community	None directly applies	Upland flushes, fens and swamps	1
M4 <i>Carex rostrata</i> - <i>Sphagnum fallax</i> mire	Transition mires and quaking bogs	Upland flushes, fens and swamps	3

9.4.37 A summary of habitat types and communities and their approximate areas within the Site is provided in Table 9.6. Note that due to small survey limitations as discussed in Appendix 9.1 the extent of habitats surveys is approximate to 283.01 ha. The total area of the Site is equivalent to 289.09 ha.

9.4.38 Full details are provided in Technical Appendix 9.1.

Table 9.6 Summary of Baseline Habitats and Vegetation Communities Within the Site

Phase 1 Habitat Type	Phase 1 code	NVC Community/ Sub-community	Extent (ha)	Relative Coverage (%)*
Semi-natural broadleaved woodland	A1.1.1		1.06	0.37
Coniferous semi-natural woodland	A1.2.1		0.92	0.32
Coniferous plantation woodland	A1.2.2		2.67	0.94
Mixed woodland	A1.3		4.28	1.51
Scattered scrub/Continuous bracken	A2.2/C1.1		11.44	4.04
Recently felled coniferous woodland	A4.2		0.20	0.07

Phase 1 Habitat Type	Phase 1 code	NVC Community/ Sub-community	Extent (ha)	Relative Coverage (%)*
Semi-improved acid grassland	B1.2	M25b, U6	103.54	36.59
Semi-improved neutral grassland	B2.2	MG6	77.67	27.44
Marshy grassland	B5	M25a, M23b	50.69	17.91
Poor semi-improved grassland	B6		5.66	2.00
Continuous Bracken	C1.1		20.69	7.31
Wet modified bog	E1.7	M20	1.69	0.60
Acid/neutral flush	E2.1	M4, M6b	1.91	0.67
Waterbody	G1		0.10	0.03
Waterbody	G2		0.02	0.01
Hardstanding	J5		0.48	0.17

Bat survey

9.4.39 Bat surveys were undertaken in 2019 (eastern MFD section only) and 2021 (whole site) in accordance with Joint Agencies guidance (2021), and comprised:

- A Bat Habitat Appraisal;
- Preliminary Roost Assessment; and,
- Ground-level Activity Surveys.

9.4.40 Surveys sought to establish the bat species assemblage using the Site, the spatial and temporal distribution of bat activity, the location and extent of commuting or foraging habitat used by bats and the locations of any roosts and swarming sites that could potentially be affected by the proposed development.

9.4.41 Full details are presented in Technical Appendix 9.3.

Habitat Assessment

9.4.42 In terms of interest for bats, the majority of the bat survey area comprises open grassland which provides limited suitable foraging and commuting opportunities.

9.4.43 Patches of woodland, bracken and scrub areas, and linear features such as watercourses, stone walls woodland edges at the border of the Site offer more suitable foraging and commuting opportunities. The linear features within and bordering the survey area also provide connectivity to other favourable habitats in the wider surrounding area.

9.4.44 The linear features, although more suitable, are either limited to the boundaries of the survey area or where they are in the survey area, they are not close to the turbine locations. The majority of the survey area, including all turbine locations, is open grassland.

9.4.45 Overall, the bat survey area (the Proposed Development) provides habitat features of relatively low value for bats, with areas of localised foraging opportunities.

9.4.46 The habitats within the Site are therefore considered to be of low habitat risk for bats, in accordance with criteria presented in Bat Conservation Trust (BCT) guidelines (Collins 2016).

Roosting Bats

- 9.4.47 Analysis using the Ecobat tool identified the possible presence of roosts of common pipistrelle, soprano pipistrelle, noctule, Leisler's bat and Myotis species within proximity to the Proposed Development, based on the recording of bat activity within the survey area within typical species-specific emergence times.
- 9.4.48 Activity within species-specific emergence times peaked at the monitoring stations deployed within the east and north west of the Site, in close proximity to adjacent coniferous woodland plantations (i.e. the Control, MS3 and MS9 as shown in Figure 9.6).
- 9.4.49 No existing roost records from within the Site were identified through a review of desk study information. Furthermore, no trees or structures were noted during surveys which were likely to have bat roost potential within 200m plus blade length of the proposed turbines.

Activity Surveys.

- 9.4.50 Bat activity surveys in 2021 recorded calls characteristic of the following species:
- Common, soprano and Nathusius pipistrelle;
 - Noctule;
 - Leisler's bat;
 - Brown long-eared bat; and,
 - Myotis species.
- 9.4.51 Common pipistrelle was the most frequently recorded species, with overall activity generally low for all species when compared against records from a similar date in a similar geographical location in Ecobat.
- 9.4.52 The highest levels of activity recorded from monitoring stations located near to the boundaries of the Site adjacent to woodland habitats and or connected to areas of higher habitat diversity and which provide higher bat commuting and foraging suitability (i.e. Control, MS2, MS3 and MS9 in Figure 9.6).
- 9.4.53 An assessment of the potential risk to bats, in accordance with Joint Agencies guidance (2021) identifies that the Proposed Development has an overall Low Site Risk, with an overall low risk for common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Noctule and Leisler's bat and for which assessment is required.
- 9.4.54 Full details are provided in Technical Appendix 9.3.

Reptile survey

- 9.4.55 Reptile 'presence/absence' surveys were carried out in August and September 2022, with reference to the methodology detailed in 'Froglife' Advice Sheet 10 'Reptile Survey'^{xviii} to identify the range of reptile species present and their relative abundance (see Figure 9.5a). 'Refugia' were placed at targeted points on 4th August 2022, selected on the basis of habitat features as recommended in the Froglife guidance. These were then left for a bedding-in period before being checked on nine separate visits between 1st and 28th September 2022.
- 9.4.56 Over the course of surveys, twelve common lizards and one slow worm were recorded across four of these visits.

9.4.57 Full details see Technical Appendix 9.2.

Future Baseline

9.4.58 In the absence of the Proposed Development, assuming a “do-nothing” scenario or gap between baseline surveys and the commencement of construction of the Proposed Development, changes in the baseline ecological conditions (i.e. distribution and/or populations of species and habitats) of the Site are most likely to result from habitat modifications within, or surrounding, the Site due to land management practices, principally, woodland planting within and surrounding the Site, and changes to livestock grazing regime within the open habitats of the Site.

9.4.59 For the MFD area of the Site any changes are likely to be small-scale, localised changes to the existing habitats and therefore will not represent a notable change in baseline conditions for habitats and species at the Site. The establishment of protected species currently considered to be absent is unlikely given the overall unsuitability of habitats present and the low likelihood that this will change substantially within the timescales under consideration for the Proposed Development.

9.4.60 For the MB area, in the absence of the Proposed Development consented coniferous planting will be undertaken across the entire northern section of the Mynydd Blaenafon plateau, and down the western boundary of the Site (see Figure 2.3), to tie in with planting that has already taken place (Figure 2.3). Subsequently the habitats within the MB area of the Site will change substantially regardless of the Proposed Development.

9.4.61 The conversion of some of the MB area from open marshy and semi-improved grassland, scrub and bracken habitat to forestry will reduce the suitability of the Site for most faunal species; in general fewer protected or notable species are associated with commercial conifer plantation than with open grassland habitats. It is likely that the overall ecological value of the MB area of the Site will be reduced, although the forest could potentially increase the attractiveness of the MB area for bats.

9.4.62 The SINC's within and surrounding the Site are noted to be threatened by encroachment of scrub and conifer self-sets from adjacent coniferous forestry, as well as intensive grazing. In the absence of nature conservation management to halt the decline in the habitats for which they are notified it is expected that habitat condition will continue to deteriorate, with associated reduction in suitability for the species which are supported by these habitats and the specific conditions found within these sites.

9.5 Inherent Design Mitigation

9.5.1 In line with the principles of proportionate EIA, embedded mitigation, including avoidance through the design process and application of industry standard good practice, are considered at the outset of the assessment. Important ecological receptor status will only be assigned where there is still considered to be the potential for significant effects on the identified receptor arising from the Proposed Development after the application of embedded mitigation measures.

Mitigation by Design

- 9.5.2 The Proposed Development has been subject to a number of design iterations and evolution in response to constraints identified as part of the baseline studies, intended to reduce environmental effects (see Chapter 4: Proposed Scheme, Alternatives for further details).
- 9.5.3 Design considerations have been incorporated to avoid or minimise adverse effects upon ecological receptors, as set out below.
- 9.5.4 The on-site track layout has been designed to minimise environmental disturbance and land take by, wherever possible, avoiding completely or minimising loss of areas of identified environmental constraints.
- 9.5.5 Design of the Proposed Development has been carried out taking consideration of bog/flush/marsh habitats in the east of the Site (within the Tyle'r Waun Site of Importance for Nature Conservation (SINC); see Appendix 9.1 for further details), with the Proposed Development's turbines located predominantly in heavily livestock-grazed semi-improved grassland in the MFD area.
- 9.5.6 The Proposed Development's turbines also achieve minimum 50m 'stand-off' distances from bat habitat features and turbine blade tips in accordance with Joint Agencies guidance (2021), see Table 9.7.
- 9.5.7 A minimum 50 m buffer has also been included around all mapped watercourses for turbine hardstanding and associated access tracks, except for watercourse crossings, for which the requirement has been minimised as part of sensitive Proposed Development design (see Chapter 11).

Table 9.7 Summary of turbine bat habitat stand-off distances.

Turbine	Indicative Hub Height (m)	Indicative Blade Length (m)	Nearest Bat Habitat Feature (height, m)	Required Distance (m)	Distance Achieved
1	105	75	Coniferous woodland (35m)	103.56	107
2	105	75	Coniferous woodland (35m)	103.56	132
3	125	75	Coniferous woodland (35m)	86.75	124
4	125	75	Coniferous woodland (35m)	86.75	202
5	125	75	Coniferous woodland (35m)	86.75	95
6	125	75	Mixed woodland (35m)	86.75	226

- 9.5.8 The requirement for new watercourse crossings has been minimised. The design of new watercourse crossings where unavoidable, will be of a design to maintain hydraulic connectivity and allow the free passage of fish and other wildlife beneath. Watercourse crossings would also be of sufficient size so as not to restrict or concentrate flows downstream and to convey flows during periods of heavy rainfall (e.g., 1 in 200-year event plus climate change allowance).
- 9.5.9 A replacement crossing will be constructed over the Nant Blaenpelenna (at SS 8158 9728). The design of the watercourse crossing is shown by Figure 4.12. This crossing is designed to

allow the continued passage of wildlife along the watercourse. Liaison is proposed with the NRW fisheries team to ensure there is accord with the replacement bridge design and function, particularly in relation to continuing to allow the free passage of fish. The track is located 50m downstream of the Cwm Blaenpelenna SINC, it will only require a small area of land (permanent foundations to be installed) and effects on the SINC can be discounted.

Good Practice Measures

Construction Environment Management Plan (CEMP)

- 9.5.10 Details of measures to protect the environment during the construction of the Proposed Development will be set out in a CEMP to be implemented at the commencement of works.
- 9.5.11 Measures will address all good practice construction measures, pollution prevention controls and monitoring to be implemented over the course of the construction and operation of the Proposed Development in line with current industry and statutory guidance, including: hours of working; noise; vibration; dust; light spill; wheel washing, and control of runoff.
- 9.5.12 Good practice measures in relation to pollution risk, sediment management, watercourse crossings and sensitive techniques with regards to construction in peatlands and near watercourses to be adopted during the construction and operation phases are detailed in Chapter 11: Hydrology, Hydrogeology Geology
- 9.5.13 Good practice measures to prevent harm to faunal species will include careful design of security lighting for works areas to avoid disturbance to faunal species, speed limits for all vehicles on Site and the careful storage of potentially dangerous substances or materials within construction compounds. Excavations will either be temporarily covered at night or designed to include a ramp.
- 9.5.14 Good practice measures to protect retained habitats during the construction works would be implemented including the sensitive demarcation of working areas, to be overseen by an Environmental Clerk of Works (ECoW).
- 9.5.15 Good practice habitat reinstatement measures would also be adopted and implemented, on areas subject to disturbance during construction works as soon as it is practical to do so.
- 9.5.16 The CEMP will be finalised and implemented in consultation with NRW and NPTCBC on the basis of the Outline Construction Environmental Management Plan (OCEMP) provided in Appendix 4.1, in accordance with a suitably worded planning condition.

Pre-construction Surveys

- 9.5.17 There is potential for a change in the distribution of protected species within the Site between the completion of baseline surveys presented herein and the commencement of construction activities for the Proposed Development. Prior to the commencement of construction activities a Protected Species Protection Plan (PSPP) would be prepared and submitted for agreement in consultation with NPTCBC and Natural Resources Wales NRW which would form part of the CEMP.
- 9.5.18 The PSPP will provision for pre-construction surveys for protected species including terrestrial mammals, reptiles and amphibians, to be undertaken within a defined period prior to the commencement of construction works. Surveys would cover all areas within 250m of the Proposed Development infrastructure and associated working areas.

- 9.5.19 The results of the pre-construction surveys would inform the need for further mitigation (if required) in respect of sensitive working practices and the requirement to consult with NRW in relation to protected species licensing.

Reasonable Avoidance Measures (RAMs)

- 9.5.20 Reasonable Avoidance Measures (RAMs) methods statements will be included in the CEMP for reptiles, amphibians and great crested newts. These will detail specific species and habitat protocols to be followed for survey, site clearance activities and construction, including (non-exhaustive):

- exclusion buffers to be implemented for key habitat features;
- extent and timing of permitted works;
- safe methods for vegetation removal including lag periods to allow species dispersal from working areas;
- creation of appropriate refuge habitat away from working areas (also tied in with measures proposed in the OHMP);
- ECoW oversight; and,
- NRW licensing requirements.

- 9.5.21 RAMs method statement, will be subject to approval by the NPTCBC and NRW, and implemented by way of a suitable worded planning condition.

Ecological Clerk of Works

- 9.5.22 A suitably qualified ECoW would be employed for the duration of the construction and works (including habitat reinstatement period), to oversee environmental protection measures and working practices specified in the CEMP and prevent breaches of legislation pertaining to protected species and habitats.

- 9.5.23 The role of the ECoW would be defined in the CEMP, and would include the following tasks:

- provide toolbox talks and information to all staff on-site, so staff are aware of the ecological sensitivities within the Site and the legal implications of not complying with agreed working practices;
- agree and monitor measures designed to minimise damage to retained habitats;
- undertake pre-construction surveys and advise on ecological issues and working restrictions where required;
- complete site-supervision works as required, in relation to sensitive habitats and protected species; and,
- Oversee restoration of working areas following construction.

9.6 Potential Effects

Receptors Scoped Out

- 9.6.1 CIEEM guidelines (2018) stipulate that it is not necessary to carry out a detailed assessment of impacts upon ecological receptors that are sufficiently widespread, unthreatened and/ or resilient to impacts of a development proposal.
- 9.6.2 As such, the assessment presented within this chapter considers the potential for significant effects upon designated sites for nature conservation and ecological receptors which are considered 'important' on the basis of relevant guidance and professional judgement.
- 9.6.3 Where ecological receptors are not considered so important as to warrant a detailed assessment or where they would not be significantly affected on the basis of baseline information, these are 'scoped out' of the assessment, and are not considered further within this chapter.
- 9.6.4 Mitigation measures for such features may however, still be outlined as appropriate, to reduce and/ or avoid any non-significant potentially adverse effects, to provide enhancements, or to ensure legislative compliance.

Habitats

- 9.6.5 Table 9.8 provides a summary of habitat losses calculated for the Proposed Development including the solar array, wind turbines and all associated above ground infrastructure:
- Direct loss - the loss of habitats and vegetation under the footprint of the Proposed Development; and,
 - Indirect loss - calculated as within 2m of direct habitat loss areas, to include for additional habitat disturbance during construction works, and within 10m of direct habitat loss areas to account for potential changes in habitat vegetation structure as a result of construction works.
- 9.6.6 Adopting a precautionary approach, it is assumed that an area equivalent to the surface area of the solar array would be lost as a result of the Proposed Development. Due to the mounted nature of panels installed, actual direct habitat losses would be considerably less, but the approach considers habitat loss as a result of habitat deteriorations due to shading.
- 9.6.7 As detailed in Table 9.8 overall habitat losses will be very small, with the majority of the habitats on the Site noted to be heavily modified by agricultural input and grazing, and which are of low ecological value. The highest value areas of habitat, comprising bog and flush habitats, are located at the far east of the Site in the Tyle'r Waun SINC, and which will not be affected by the Proposed Development.
- 9.6.8 Some of the grassland habitats present on Site may in some circumstances correspond to habitats protected under S7 of the Environment (Wales) Act 2016, and/or Annex 1, specifically M23 *Juncus effusus* - *Galium palustre* rush pasture and M25 *Molinia caerulea* – *Potentilla erecta* mire, which can correspond with 'Molinia Meadows on Calcareous, Peaty or Clayey Silt-laden Soils (*Molinia caerulea*)' and Purple Moor-grass and Rush Pastures. However, the UKBAP states that this priority habitat consists of "various species-rich types of fen meadow and rush pasture. Purple moor-grass *Molinia caerulea*, and rushes, especially sharp-flowered rush *Juncus acutiflorus*, are usually abundant."

- 9.6.9 The UKBAP describes this habitat as occurring on poorly drained acid soils in lowland areas. Here the habitat appears to primarily occur at or above around 300m altitude so does not fit within the lowland category.
- 9.6.10 In addition, the rush and purple moor-grass habitats on the Site are all species poor, extremely so in the case of the purple moor-grass dominated areas. Also, the rush habitats on Site are of the type dominated by *Juncus effusus*, not *Juncus acutiflorus*. Therefore, these habitats do not represent examples of priority habitat.
- 9.6.11 U6 acid grassland and MG6 neutral grassland are not included in the NVC communities listed on the UKBAP as corresponding with the Lowland Dry Grassland Priority Habitat and are therefore not considered to represent examples of priority habitat.
- 9.6.12 Notwithstanding Good Practice measures to prevent indirect impacts to habitats and sensitive plant species during the construction and operational phases, and the requirement to protect hydrological conditions which may underpin some of the potential GWDTE habitats (see Chapter 11), it is considered that no priority, protected or notable habitats will be affected by the Proposed Development and so direct and indirect impacts to habitats are scoped out of detailed impact assessment in accordance with CIEEM guidance.

Table 9.8 Direct and indirect (temporary) loss of habitat (ha) from the Proposed Development

Habitat	Phase 1 habitat Code	NVC	Direct loss	Indirect loss (2m)	Indirect loss (10m)
Coniferous plantation woodland	A1.2.2	-	0.293	0.116	0.692
Mixed woodland	A1.3	-	0.121	0.180	1.030
Scattered scrub/Continuous bracken	A2.2/C1.1	-	0.029	0.024	0.133
Semi-improved acid grassland	B1.2	M25b	0.020	0.015	0.082
Semi-improved acid grassland	B1.2	-	3.489	0.045	0.195
Semi-improved acid grassland	B1.2	U6	1.315	0.690	3.515
Semi-improved neutral grassland	B2.2	MG6	8.569	1.514	6.630
Marshy grassland	B5	M23b	0.225	0.139	0.616
Marshy grassland	B5	M25a	1.183	0.578	2.863
Poor semi-improved grassland	B6	-	0.148	0.138	0.680
Continuous Bracken	C1.1	-	0.156	0.238	1.383
Running Water	G2	-	0.001	0.001	0.007
Standing Water	G1	-	0.000	0.000	0.087
Hardstanding	J5	-	0.000	0.005	0.046

Terrestrial mammals

- 9.6.13 No existing records or evidence of the use or presence of breeding sites of protected mammal species were recorded within the Site during baseline studies.
- 9.6.14 The potential for significant effects upon protected terrestrial mammal species, including as a result of habitat loss and the potential for disturbance, is therefore scoped out of detailed assessment.
- 9.6.15 It is acknowledged that such species may establish within the Site prior to the commencement of construction works. Measures to enable the protection of such species during construction activities, including the requirement for pre-construction surveys will be included within a

CEMP, on the basis of those measures provided within the OCEMP presented as Technical Appendix 4.1.

Reptiles and Amphibians

- 9.6.16 Providing the implementation of appropriate mitigation measures provisioned for as part of the Proposed Development, reptile and amphibian species are considered unlikely to be subject to significant effects as a result of wind farm developments.
- 9.6.17 There is also no evidence that solar arrays pose a risk of direct adverse impacts to populations of these species groups and so, with embedded good practice mitigation in place to protect them from direct mortality during the construction phase, the only route to impact for reptiles and amphibians is indirectly via loss of habitats which support them.
- 9.6.18 Common lizard and slow worm were confirmed to be present within the Site, during baseline surveys in 2022. The majority of the habitat to be lost within the Site as a result of the Proposed Development are however heavily grazed semi-improved grassland, and which provide sub-optimal habitats for reptile and amphibian populations.
- 9.6.19 There are no ponds located within the Site and no existing records of great crested newt identified within proximity to the Site from desk study sources. Waterbodies identified adjacent to the Site, within the Tonmawr Minewater Treatment & Surrounding Habitats SINC are identified, however such settlement ponds are contaminated with heavy metals and so not suitable for herpetofauna. Additional waterbodies identified outwith the Site are also considered to be separated from the Proposed Development by barriers to movement, including roadways and upon which effects will not occur.
- 9.6.20 RAMs method statements will be included within the CEMP and which will serve to protect individual reptiles and amphibians from death, injury or harm over the course of construction works. Method statements will be agreed in consultation with NRW and NPTCBC on the basis of measures presented within the OCEMP, provided as Technical Appendix 4.1.
- 9.6.21 The potential for significant effects upon reptiles and amphibians is therefore scoped out of detailed assessment, on the basis of absence and low suitability of breeding and foraging habitats within the Site and the implementation of standard good practice mitigation measures.

Invertebrates

- 9.6.22 Given the low likelihood of population-level effects from developments of this kind, it is not considered a proportionate requirement to carry out baseline invertebrate surveys. In the absence of Wales-specific guidance Natural England's Higher Level Stewardship (HLS) Farm Environment Plan (FEP)^{xix} guidance (Natural England, 2010) recognises that it is not always practical to monitor for invertebrates, and so provides an alternative method to identify habitats which are likely to have high invertebrate biodiversity value.
- 9.6.23 Desk study records returned from the SEWBRc included 29 protected or notable species of invertebrate, including 19 species of moth and six butterfly species (see Appendix 9.1). The Cwm Blaenpelenna SINC adjacent to the Site is notified for nine invertebrate species of conservation importance including the small pearl-bordered fritillary and dingy skipper butterflies, both of which were included in the SEWBRc records returned for this area of the Site (see Figure 9.2c).

- 9.6.24 The predominant habitats within the Site, including under the footprint of the solar array, is semi-improved acid grassland. Semi natural grasslands can be an important resource for invertebrates, with higher invertebrate species richness generally correlated to higher plant species-richness. Much of the open grassland habitat within the Site, including in the locale of the solar element of the proposed development, is heavily sheep-grazed with an associated reduction in vegetative cover.
- 9.6.25 With reference to the UK National Ecosystem Assessment (UK NEA), upland acidic grassland is not considered a priority habitat since it is a result of overgrazing, thus is species-poor and lacks biodiversity⁵. Heavily grazed grassland limits wildflower growth, reducing nectar (food resources), egg laying habitats and offers minimal shade and predator protection. Research carried out by the Game and Wildlife Conservation Trust (GWCT)⁶ found that grazed habitats reduce opportunities for butterflies, moths, beetles and spiders due to lack of egg laying opportunities and food resource but offer more opportunities for flies.
- 9.6.26 Baseline Phase 1 habitat surveys identified some areas of semi-improved grassland as containing a variety of species including Yorkshire-fog, common bent, meadow buttercup, sweet vernal grass, occasional soft rush, red fescue, crested dog's tail, white clover, creeping thistle and common mouse-ear, several of which species may be indicative of species-poor grasslands (Natural England 2010). In the locale of the solar element of the Proposed Development, fewer than four of the micro-habitats specified in Natural England (2010) 'key to identify habitat for invertebrates' are present, and so this part of the Site is considered to not have value or potential for invertebrates, in accordance with this guidance.
- 9.6.27 Measures provided for in the OHMP will improve habitat for invertebrates elsewhere on Site and within the SINC, including via provision of hedgerows alongside existing fences and restoration of peatland habitat. It is also proposed to address scrub encroachment within the SINC, and provision for monitoring invertebrates within the SINC is also included. In view of this it is considered that there is no route to significant adverse impacts for invertebrates, but that the Proposed Development will provide habitat enhancements that will be beneficial to invertebrate species both within the Site and in the wider area.
- 9.6.28 The potential for significant effects upon invertebrate populations are therefore scoped out of detailed assessment.

Receptors Scoped in

- 9.6.29 The assessment presented within this chapter considers in detail the potential for significant effects upon bat species in relation to the construction, operation and decommissioning of the Proposed Development.
- 9.6.30 On the basis of justification provided above, the potential for significant effects upon all other identified ecological receptors as a result of the construction, operation and decommissioning of the Proposed Development, both alone and in-combination with other developments is considered highly unlikely and therefore scoped out of detailed assessment.

⁵ Available at <https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/uknaturalcapitaldevelopingseminaturalgrasslandecosystemaccounts> last accessed 15/11/2022

⁶ Available at: <https://www.gwct.org.uk/research/species/birds/black-grouse/sheep-grazing,-invertebrates-and-black-grouse/> last accessed 15/11/2022

- 9.6.31 For the purposes of assessment, the bat species assemblage established to use the Site and surrounding area from baseline bat activity surveys and desk study sources due to their inclusions as UKBAP priority species, on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), Section 7 of the Environment (Wales) Act 2016, Annex II or Annex IV of the Habitats Directive, but for which low levels of activity were recorded, are assigned a Medium value with in accordance with the criteria in Table 9.1.

Construction Phase

Bats

- 9.6.32 No potential bat roosting habitat will be affected by the Proposed Development, with no direct effects upon roosting bats.
- 9.6.33 Baseline bat activity surveys have established that the Site is subject to low levels of bat activity. The open and semi-improved nature of grassland habitats to be lost from within the Site provide low foraging and commuting interests to bats, with adjacent habitats including woodland edges demonstrated as providing higher value habitats for foraging and commuting bat species.
- 9.6.34 Overall habitat losses for bats as a result of the Proposed Development will therefore be very small, relative to the availability of comparable habitats remaining within the Site and the extent of preferable habitats within the surrounding wider area.
- 9.6.35 Potential habitat loss effects upon bats are therefore of Negligible magnitude, of no more than Minor adverse significance, and which is Non-significant.

Operational Phase

Bats

- 9.6.36 The solar array component of the Proposed Development is not predicted to have any significant effect upon bats during the operational phase of the Proposed Development. There is little substantiating evidence for potential collision risks for bats associated with solar developments. Modern solar panel designs which will be installed as part of the Proposed Development, typically support black frames and grid lines, which breaks up the flat, smooth panel surface.
- 9.6.37 The assessment of operational phase impacts upon bats therefore focusses on potentially significant effects results from the operation of proposed wind turbines.
- 9.6.38 Operational wind turbines can affect bats in a number of ways, although the main concerns to species populations relates to collision mortality, barotrauma (i.e. injury caused by a change in air pressure) and other injuries resulting from collision with, or flying in very close proximity to moving turbines (Joint Agencies guidance, 2021).
- 9.6.39 The assessment of potential effects upon bats resulting from the operation of the proposed wind turbines has been based on the two-stage methodology set out in Joint Agencies guidance (2021) using the Ecobat tool. Full details are presented in Technical Appendix 9.3.
- 9.6.40 In accordance with Joint Agencies guidance (2021) a Stage 1 'Initial Site Risk Assessment' of the potential risk level of the Proposed Development site has been undertaken based on a consideration of the Sites habitats and development-related features. This concludes that the Site is assessed as having an overall 'Site Risk' of 2, which represents a Low Site Risk.

- 9.6.41 Stage 2 'Overall Risk Assessment' of the two-stage process detailed within Joint Agencies guidance (2021) has then subsequently been completed to provide an overall assessment of risk to bat species, by considering the conclusions of Stage 1 in relation to relative levels of bat activity obtained through using the Ecobat tool and considering the vulnerability of species recorded, at the population level.
- 9.6.42 In accordance with Joint Agencies guidance (2021), Stage 2 has been carried out separately for all high collision risk species recorded during baseline bat activity surveys, and which includes the following species:
- Soprano pipistrelle;
 - Common pipistrelle;
 - Nathusius pipistrelle;
 - Noctule; and,
 - Leisler's bat.
- 9.6.43 The calculated Stage 2 'Overall Risk Assessment' per species, both temporally and spatially is presented in Technical Appendix 9.3.
- 9.6.44 It is highlighted that the Ecobat tool is in its infancy and given current limitations in available reference data on the database for many developments, definitive bat activity for regions are not generated and bat activity representations for regions are instead considered to be indicative. On this basis, the conclusions of the Stage 2 'Overall Risk Assessment' concludes that there is a Low/Medium likelihood of the proposed Development resulting in significant impact on bat species populations.
- 9.6.45 In summary, the Overall Risk Assessment for common pipistrelle, noctule and Leisler's bat is considered to fall under "Low/Medium Site Risk" and "Low Site Risk" for soprano pipistrelle and Nathusius pipistrelle, but given the current limitations of the Ecobat tool, these conclusions are likely precautionary and should be treated with caution.
- 9.6.46 The risk of operational mortality to bats is generally acknowledged to be lowest at locations with low bat activity. Activity of all bat species recorded was consistently low to moderate across all monitoring stations, with the highest activity recorded at those monitoring stations located closer to adjacent woodland boundaries and which likely provide increased foraging habitat interests.
- 9.6.47 No trees or structures with the potential to support maternity roosts and/or significant swarming or hibernation roosts are present within 200m plus blade length of the proposed turbines.
- 9.6.48 Joint Agencies guidance (2021) advises that to reduce potential impacts upon bats, resulting from operational wind turbine development, a 50m 'stand-off' distance should be maintained around bat habitat features, into which no part of the turbine intrudes. The guidance provides a formula for calculating this 'stand-off' distance.
- 9.6.49 The layout of the Proposed Development has adopted a minimum 50m buffer from the nearest bat habitat features, and which is exceeded for all turbine locations (see Table 9.7). The proposed turbine locations also achieve a 50m stand-off from areas of recently completed and proposed plantation planting within the Site as shown in Figure 4.15 and all watercourses.

9.6.50 Based on activity levels recorded and subsequent analysis as outlined, death or injury levels for bat species are considered to be low. The proposed Development is not considered to represent a site of concern to bat collision risks following the approach to assessment set out in Joint Agency guidance (2021).

9.6.51 It is however, acknowledged that low risk sites can still result in bat casualties, but for which embedded 'stand-off' distances from habitat features in accordance with Joint Agencies guidance (2021) is considered adequate mitigation to avoid potentially significant operational mortality risks to bats at most low-risk locations.

9.6.52 Impacts of bat collision risk mortality are subsequently considered to be of no more than a long-term effect, of Low magnitude and of Minor adverse significance and which is Non-significant.

Decommissioning Phase

9.6.53 Potential decommissioning effects are considered to be similar to those identified for the construction phase (i.e. disturbance/displacement). Decommissioning effects are therefore not considered separately for each ecological receptor.

9.6.54 In the absence of mitigation, decommissioning effects may result in the loss of key habitats and the disturbance and/or injury or killing of key species.

9.6.55 Providing the implementation of good practice measures such as those summarised in section 10.5 and included in the outline Construction Environmental Management Plan (CEMP) (Appendix 4.1), be included, it is unlikely that significant effects upon important ecological receptors would occur during the decommissioning phase.

9.7 Additional Mitigation

9.7.1 Providing the implementation of embedded mitigation outlined in Section 9.5, no significant effects upon ecological receptors are predicted to occur as a result of the Proposed Development.

9.7.2 Additional mitigation measures are therefore not required.

9.7.3 Consideration has however been provided in relation to the potential for significant cumulative operational effects upon bats, and which adopting a precautionary approach may be uncertain. Further discussion and the outline of precautionary mitigation is therefore provided in Section 9.11.

9.8 Residual effects

9.8.1 Residual effects upon ecological receptors will not be significant.

9.9 Implications of Climate Change

9.9.1 The UKCP18 climate change projections, most notably predict increased summer and winter temperatures and higher average precipitation rates in summer and winter. These factors are likely to result in an extended growing/breeding season with earlier in the year vegetation growth and breeding activity of key species. Increased rainfall is likely to result in greater vegetation growth, although for some botanical species it may have adverse effects (through water-logging). Higher rates of juvenile mortality for key species may be expected as a result of higher rates of rainfall. The bat activity season is likely to be extended by the higher

seasonal temperatures, but conversely higher rates of rainfall are likely to adversely affect foraging activity.

9.9.2 Habitat enhancement measures presented in the OHMP are unlikely to be substantively affected by climate change. However, establishment of scrub and saplings in areas such as the SINC is expected to increase with warmer and wetter climates. This makes adopting the habitat enhancement measures (such as scrub/sapling clearance) within the OHMP even more prudent.

9.9.3 The opposing potential effects of climatic change on ecology receptors makes predicting future likely outcomes difficult. However, potential effects on ecology receptors detailed in this chapter are not predicted to substantively change in relation to climate change over the lifespan of the Proposed Development.

9.10 Habitat Management Measures and Biodiversity Net Benefits

9.10.1 Measures for habitat enhancement, if the Proposed Development is consented, are detailed in the Technical Appendix 9.4: OHMP, but in summary these would comprise:

- Enhancement of Moorland Habitats;
- Enhance Habitat for Reptiles and Amphibians;
- Manage Mosaic Habitat;
- Monitoring SINC Condition; and,
- Enhancement of Opportunities for Nesting and Foraging Birds.

9.10.2 The specifics into each measure would be agreed through consultation with NRW, NPTCBC (and additional relevant stakeholders).

9.10.3 The biodiversity net benefits of these measures are considered in the context of the updated National Planning Policy for Chapter 6 of Planning Policy Wales (PPW)⁷. Where 'policy' is stated below, this is in reference to those stated in this updated Chapter 6.

9.10.4 As per the policy, peatlands should be recognised for their value as part of resilient ecological networks, as well as their important role for storing soil carbon. In accordance with the policy, considerable weight should therefore be applied to protect areas of peat. Note, the Proposed Development has avoided important peatland habitats identified, and measures to enhance and restore areas such as M25a NVC plant community (up to 6.74ha) where on deeper peat and the wet modified bog within the Tyle'r Waun SINC (1.69ha) to better quality mire/bog habitat would be investigated and implemented. Measures including ditch blocking, adoption of a sensitive livestock grazing regime and surplus peat being used for enhancement will be investigated and adopted (in appropriate areas). Improving the quality of peatland habitats will have net benefits in terms of improved biodiversity and carbon sequestration capabilities.

9.10.5 The policy states that developments should be shaped by the principle of retaining and enhancing existing habitats and species, and restoration of peatland habitats is in accordance with this statement. The measures which would be adopted if the Proposed Development is consented would be enhancement of onsite habitats for protected species, including reptiles (e.g. adder and common lizard) and amphibians. This will include creation of hibernacula and

⁷ The Annex (published on 18th October 2023) is to be considered with immediate effect and will be included in the next iteration of PPW (version 12).

the adoption of sensitive livestock grazing regimes, to avoid over-grazing. As well as herpetofauna benefitting from such measures, other wildlife including invertebrates, small mammals and birds will also benefit. These measures would be adopted within the Tyle'r Waun SINC which has adder and common lizard as qualifying features. Given the habitats and qualifying features (including Section 7 species) within this SINC would be enhanced, this is in accordance with policy that non-statutory designated sites and habitats need to be properly protected and managed and their role in resilient ecological networks safeguarded.

- 9.10.6 The Cwm Blaenpelenna SINC would also be a focus for enhancement works. The SINC is a previous colliery site which is a mosaic habitat of open bare ground, heath, grassland, scrub, wetland and woodland. The SINC has suffered from scrub/tree encroachment and due to lack of appropriate management is losing its mosaic character, which will mean that invertebrates (like butterflies) are likely to be reducing in number. Note, the SINC is not routinely monitored so the effect is not known. It is proposed that an appropriate plan of scrub/tree clearance to return the SINC's mosaic character would be adopted, with the extent, and frequency, of clearance agreed with NRW and NPTCBC. This measure would improve habitat conditions of the SINC and enhance the site for qualifying SINC features, including butterflies (including Section 7 species).
- 9.10.7 As per the policy, monitoring, along with rectification strategies, are fundamental for ensuring notable biodiversity, sites and habitats are maintained (or improved where enhancement measures are adopted). Accordingly, monitoring would be undertaken for all enhancement measures listed in Section 9.10.1 and within the OHMP. This includes monitoring of qualifying features of the Tyle'r Waun SINC and Cwm Blaenpelenna SINC. This would include surveys prior to enhancement and then repeated surveys over the course of the Proposed Development's lifespan. This would ensure that biodiversity benefits would be identified, and any rectification measures (if required) adopted.
- 9.10.8 The policy states that development must minimise the impact on biodiversity and maintain the largest possible area of existing habitat supporting biodiversity and functioning ecosystems, particularly Section 7 habitats and species. Within management of these areas and the Section 7 habitats and species key. The measures listed above would benefit Section 7 habitats (like mire/peatlands) and species (like reptiles). Ornithological interest (including Section 7 ground-nesting species) would also benefit from measures including mire/bog enhancement, and any targeted scrub/tree clearance. Furthermore, other measures including the installation of nest boxes and hedgerow planting would provide nesting and/or foraging resources for a host of bird species, including Section 7 species.
- 9.10.9 Trees and hedgerows are of great importance for biodiversity, as stated in the policy, and all efforts should be made to maintain these habitat features given their multi-faceted role, including in connecting habitats for resilient ecological networks. With the exception of the targeted tree/scrub clearance proposed in Cwm Blaenpelenna SINC, to benefit qualifying features, by returning the site back to a mosaic habitat, tree clearance would be minimal as a result of the Proposed Development, and no hedgerow would be removed or affected. The creation of the hedgerow, with the principal focus associated with the proposed solar arrays, will contribute towards improving habitat connectivity through that part of the Site. This will also benefit foraging bats who would likely use the habitat features as a movement corridor, as well as other mammals, birds and invertebrates.
- 9.10.10 Further details are provided in the OHMP.

9.11 Cumulative effects

9.11.1 Only the potential for significant cumulative operational effects upon bat species are considered within this assessment. The potential for the Proposed Development to contribute to significant cumulative effects upon all other ecological receptors is not considered likely, due to short term nature of construction works and infrequency of operational maintenance works, the very small area of habitats within the Site to be directly or indirectly affected and habitat enhancement measures proposed and/or the absence of importance of the Site for individual species or assemblages.

9.11.2 In accordance with Joint Agencies guidance (2021) a review of available EIA documentation for other wind farm developments located within 10km of the Proposed Development site (see Table 9.9 and Figure 3.1) has collated information regarding predicted impacts upon bats.

Table 9.9 Wind farm developments within 10km of the Proposed Development site.

Development	Status	Distance	Summary of predicted effects upon bats
Pen y Cymoedd Figure 3.1 ID 1	Operational	0.4 km	Transect bat activity surveys undertaken in 2008, with reference to superseded survey guidance applicable at the time. Species recorded included Common pipistrelle, soprano pipistrelle and Myotis species, with survey area comprising large area of conifer, clearfell and riparian habitats. Given the lack of high risk species and the general low level of activity recorded, it was concluded that it was unlikely the wind farm would have a significant impact on local bat populations.
Fynnon Oer Figure 3.1 ID 2	Operational	1.3 km	No information available.
Melin Court Figure 3.1 ID 30b	Operational Amendment to tip height in Planning	2.6 km	Transect and static bat activity and emergence surveys undertaken in 2013, with reference to now superseded survey guidance applicable at the time. Site classified as low risk in relation to the potential effects of the development upon bats, with habitats primarily comprising open grasslands subject to agricultural improvements. Surveys recorded common pipistrelle, soprano pipistrelle, Myotis bats, Nathusius' pipistrelle, long-eared bat and noctule. Overall low levels of activity recorded. On the basis of low levels of activity it was confirmed that the application site can be classified as low risk to bats, of local value for the local bat populations, with habitats within the Melin Court valley outwith the application boundary likely to be of greater importance for bats.
Y Bryn Figure 3.1 ID 31	Pre-application	2.6 km	Cumulative effects not considered, as it cannot be ascertained with certainty if the development will proceed to a planning application.
Lynfi Afan (Mynydd Y Gelli) Figure 3.1 ID 3&4	Operational	5.0 km	Bat activity transect surveys undertaken in 2005, 2008 and 2010 with reference to now superseded guidance applicable at the time. Species recorded included common pipistrelle, soprano pipistrelle, noctule and Myotis species, with overall low levels of activity recorded, particularly in the higher open areas of the site where turbines would be located. No evidence of any bat roosts. Assigned a Parish value for bats. Final scheme design adopted 50m turbine buffer from edge of forestry plantations, with areas where high levels of

Development	Status	Distance	Summary of predicted effects upon bats
			bat activity avoided. Assessment concluded that given the relatively low numbers of bats recorded and the avoidance of potential effects through site selection, the development does not pose a high risk to bats.
Foel Trawsnant Figure 3.1 ID 38a	Consented	6.7 km	Updated bat activity transect and static surveys undertaken in 2018 with reference to now superseded guidance applicable at the time. The bat community established was considered to be unexceptional and consistent with the open habitats present and included common, soprano and Nathusius' pipistrelle; noctule; long-eared bat species; Myotis species; Nyctalus species; Nyctalus or serotine; and a small number of unidentified calls that were probably bats. Activity was heavily associated with linear features (principally treelines), with activity in the open areas of the site much lower. Results considered consistent with previous surveys undertaken in 2010 and 2012-2013, with the overall bat commuting considered to be of negligible importance. Scheme design adopted 50m stand-off between turbine blade tips and the nearest features likely to be used by bats. Assessment concluded that whilst operational mortality is likely, due to low activity levels and low numbers of high collision risk species recorded and the incorporation of stand-off distances, the development would be unlikely to have any significant effects on local bat populations.
	In-planning		Updated assessment based on previous survey work from 2018, but considers current Joint Agencies guidance (2021). Given the low level of bat activity recorded and the fact that common pipistrelle, which are common and widespread, form the majority of contacts for high collision risk species, the assessment concludes that increased rotor diameter at turbine locations is unlikely to affect the favourable conservation status of bat populations, with the magnitude of risk increasing from negligible to very low and potential operational risks remaining not significant.
Mynydd Brombil Figure 3.1 ID 5	Operational	7.8 km	Bat activity transect and automated surveys undertaken in 2011 which recorded common pipistrelle, soprano pipistrelle, Noctule, Myotis species and unidentified 'big bat' species. Given the low levels of bat activity recorded during surveys and the low percentage of high risk bat species passes it was considered unlikely that bats will be significantly affected by the proposed development. The impacts of the scheme (in terms of potential risk of mortality and impact on bat populations) is considered to be low, due to the predominance of low risk species at population level and high levels of activity associated with habitat features over 50 metres away from any of the turbine locations, compared to only low numbers of passes recorded at the detector located within the arable field where each of the turbine will be situated.

Development	Status	Distance	Summary of predicted effects upon bats
Upper Ogmore Figure 3.1 ID 46	Consented	8.6 km	Low activity of Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, noctule, Leisler's bat and serotine were recorded during surveys in 2019. The overall risk to all species of bat recorded is appraised as low. As a precaution, all turbines will be feathered to reduce rotation speed while idling (not generating a commercial output). No significant effects on bats are predicted.
Maesgwyn Extension Figure 3.1 ID 6	Operational	9.3 km	Updated assessment including static bat activity surveys undertaken in 2015 in accordance with now superseded guidance applicable at the time, which identified a low species diversity at proposed turbine locations. Species recorded included common pipistrelle, soprano pipistrelle, Myotis species and unknown bat species. No high impact species recorded. Any micro-siting will comply with 50m bat buffers from forest edge to turbine tip, development also includes for the management of oversail areas to maintain unsuitability for bats and to maintain 50m bat buffers. Assessment concludes no significant effects to bats on the basis of very low activity levels for species with a high collision risk and incorporation of best practice guidance in relation to wind farm design for bats. Development also includes production of a Bat Mitigation Plan to monitor impacts and identify any required additional mitigation if significant impacts are identified.
ABP Margam Sands Figure 3.1 ID 51	Operational	10.0 km	Assessment comprises Preliminary Ecological Appraisal with no detailed bat activity surveys undertaken. Assessment concludes the site is unsuitable for foraging bats as it does not support features (e.g. hedgerows/trees) conducive to this behaviour and bats are unlikely to be present.

9.11.3 The assessments upon bat species presented within the EIA documentation of those windfarm developments considered for cumulative effects in-combination with the Proposed Development, were in the main undertaken prior to the publication of current Joint Agency guidance (2021). Whilst it is not possible to undertake a precise cumulative assessment with these developments using available information, due to the differences in baseline survey and assessment methodologies used, a high-level cumulative appraisal is undertaken to predict any combined significant effects.

9.11.4 Baseline bat activity levels for all other wind farm developments within 10km of the Proposed Development site as summarised in Table 9.9, were generally found to be low and which indicates a 'low risk', with developments incorporating recommended stand-off buffers between turbine blade tips and bat habitat features. This is in accordance with current Joint Agencies guidance (2021) and is considered to be adequate mitigation to preclude the potential for significant operational mortality effects upon bat populations for low risk sites.

9.11.5 On the basis of overall low levels of baseline bat activity reported for all developments from information publicly available, their low risk nature and implementation of acceptable mitigation, summarised in Table 9.9, significant cumulative operational effects upon bat

species should therefore be considered very unlikely, but cannot be precluded with absolute certainty due to the limitations of available information.

- 9.11.6 To further inform the potential for significant cumulative operational effects upon bat species, operational monitoring reports were obtained in consultation with Vattenfall for the adjacent Pen y Cymoedd wind farm, given the potential for significant cumulative effects with this operational development is considered more likely on the basis of proximity and size.
- 9.11.7 For the purposes of assessment, reports were not obtained to review the approach to monitoring or efficacy of monitoring undertaken but to identify known potential collision mortality risks to bat species as a result of onshore wind farm development, relevant to the locale.
- 9.11.8 In accordance with Condition 6 of the operational Pen y Cymoedd Wind Farm post construction bat monitoring, including activity and collision mortality surveys, has been undertaken in 2017, 2019, 2020 and 2021. It is understood that the results of monitoring have been used to refine the approach to monitoring in each subsequent year and subject to discussion with consultees, the need for further mitigation.
- 9.11.9 Operational monitoring reports were provided for the 2017, 2019 and 2021 survey periods. In review, bat casualties recorded at the Pen y Cymoedd wind farm have included:
- 2021: seven casualties, identified as noctule and pipistrelle species. Mortality rates found to be higher during the autumn survey period, in comparison to the summer and which follows the trend during previous years. Relative bat activity increased for all species in the autumn, as did the number of bat corpses found during the survey.
 - 2019: seven of pipistrelle species. Mortality rates were higher in the autumn than summer, but due to idling in summer 2019, there was considered to be no correlation between activity and mortality rates as had been observed in 2017 (and 2021), with activity levels found to be higher in the summer than in autumn.
 - 2017: seven casualties, identified as noctule and pipistrelle species. Most casualties found on clear felled ground and in the autumn, but were found in all habitat types. Bat activity levels recorded were considered to be low, with relative activity increased for all species in the autumn, as did the number of bat corpses found.
- 9.11.10 In review of monitoring data for the Pen y Cymoedd wind farm, it is suggested that bat collision mortality rates are highest during the autumn activity period, and for which higher levels of bat activity are recorded.
- 9.11.11 In review of baseline bat activity surveys completed for the Proposed Development and detailed in Technical Appendix 9.3, overall bat activity was low for all species, with peaks of higher activity for some species occurring in the summer and autumn months, with low activity consistently recorded in the spring. This is in accordance with current understanding, that bat activity is typically higher in the autumn, as bats forage more widely prior to winter hibernation, and the population comprises adults and summer offspring (Collins, 2016).
- 9.11.12 In the absence of robust information regarding UK bat population estimates and accurate measures of mortality at onshore wind farms, the potential risk of significant cumulative operational collision mortality to bats as a result of the Proposed Development in-combination with the Pen y Cymoedd Wind Farm and other wind farms cannot be precluded with a degree of certainty.
- 9.11.13 The Proposed Development would only be considered to contribute a very small potential risk to significant effects on account of relative size and reduced habitat suitability for bats.

9.11.14 Nevertheless, some uncertainty remains, and therefore best-practice precautionary mitigation is proposed.

9.12 Precautionary Mitigation

9.12.1 No significant effects upon ecological receptors are predicted to occur and therefore mitigation for the Proposed Development in isolation is not required.

9.12.2 However, monitoring data from the adjacent at Pen y Cymoedd Wind Farm has demonstrated that bat fatalities do occur locally, and therefore the cumulative effects have the potential to become significant. Subsequently, in accordance with Section 7.1.3 of the Joint Agencies (2021) guidance, it is proposed there will be a reduced idling speed for the proposed turbines.

9.12.3 Joint Agencies guidance states that a reduction in speed resulting from feathering, compared with normal idling, may reduce fatality rates by up to 50%. This approach is recommended where there remains uncertainty over the risk posed to bats.

9.12.4 With the implementation of reduced idling speeds at the proposed turbines, no significant cumulative effects upon bats are predicted to occur as a result of the Proposed Development.

9.13 Monitoring

9.13.1 Post-construction monitoring is proposed to assess bat activity from the outset of the operational phase of the Proposed Development, over a period to be agreed with PEDW, in consultation with NRW. This will assess bat activity and identify whether any further mitigation is required.

9.14 Grid Route

9.14.1 The indicative grid connection route corridor for the Proposed Development is shown on Figure 4.14. An appraisal of potentially significant effects upon ecological receptors is provided on the (worst-case) basis of underground cabling, which will predominantly be close to/along existing tracks and road network, with sections likely routing through habitats predominantly comprising open grasslands grazed by livestock.

9.14.2 The installation would not result in any permanent habitat losses, given there will be appropriate reinstatement of habitats, with temporary losses considered minimal and will comprise grassland habitats in accordance with a CEMP.

9.14.3 Ecological walkover surveys (to include an Extended Phase 1 Habitat Survey) would be undertaken of the connection route and which will serve to identify the presence and/or potential presence of protected species, with appropriate species-specific surveys undertaken where necessary to further inform the requirement for mitigation including route design and/or licencing from NRW.

9.14.4 Providing mitigation measures are implemented on the basis of appropriate baseline information, potentially significant effects upon ecological receptors would be very unlikely.

9.15 Summary

9.15.1 A summary of the assessment presented within this chapter is set out in Table 9.10.

Table 9.10 Summary of effects

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Construction Phase					
Bats	Habitat Loss/Disturbance	Minor adverse, Non-significant	Not required.	Minor adverse	Not significant
Operation Phase					
Bats	Collision risk mortality	Minor adverse, Non-significant	Not required. Precautionary mitigation is proposed given the results of the cumulative assessment, and this will comprise of feathering turbines (reduce speed while idling)	Minor adverse	Not significant
Decommissioning Phase					
Bats	Habitat Loss/Disturbance	Minor adverse, Non-significant	Not required.	Minor adverse	Not significant

References

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- ⁱⁱ The Habitats Regulations <https://www.legislation.gov.uk/ukdsi/2019/9780111176573>.
- ⁱⁱⁱ The Environment (Wales) Act 2016
<https://www.legislation.gov.uk/anaw/2016/3/contents/enacted>.
- ^{iv} The Wildlife and Countryside Act 1981 (as amended)
<https://www.legislation.gov.uk/ukpga/1981/69>.
- ^v The Protection of Badgers Act 1992 <https://www.legislation.gov.uk/ukpga/1992/51/contents>
- ^{vi} Planning Policy Wales 11 (2021) - Chapter 6 Distinctive and Natural Places
https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf.
- ^{vii} Technical Advice Notes 5 (2009) – Nature Conservation and Planning
<https://gov.wales/technical-advice-note-tan-5-nature-conservation-and-planning>.
- ^{viii} Countryside Council for Wales (2010) Assessing the Impact of Windfarm Developments on Peatlands in Wales
- ^{ix} Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London
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10 Ornithology

10.1 Introduction

- 10.1.1 This chapter considers the potential for significant effects on important ornithological receptors¹ associated with the construction, operation and decommissioning of the Proposed Development. Within this chapter and assessment all elements of the Proposed Development are regarded under the term 'Proposed Development' and include turbines, ancillary infrastructure, solar array area and area of underground electrical cabling between the turbines and solar array and onsite sub-station (as detailed in Chapter 4: Proposed Scheme, Alternatives).
- 10.1.2 The only exception is the 7km proposed linear grid connection running south-west between the Site and near the M4 at Briton Ferry (see Figure 4.14), which is considered separately in this chapter in section 10.11.
- 10.1.3 The assessment presented within this chapter has been informed by a comprehensive baseline dataset, comprising specifically targeted ornithological field surveys of important and legally protected species identified during desk study and in consultation with Natural Resources Wales (NRW), Neath Port Talbot County Borough Council (NPTCBC) and Planning and Environment Decisions Wales (PEDW). The assessment also draws on pre-existing information, where appropriate, from other key sources referenced herein and is based on the Guidelines for Ecological Impact Assessment (EclA) in the United Kingdom (CIEEM, 2018).
- 10.1.4 The specific objectives of this chapter are to:
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
 - Describe the ornithological baseline conditions at the Proposed Development and associated Study Areas, to identify the ornithological receptors which will be the focus of this assessment;
 - Evaluate the sensitivity of each ornithological receptor;
 - Describe the potential impacts, including direct, indirect and cumulative impacts;
 - Describe the mitigation measures proposed to avoid, reduce and offset potential significant adverse effects; and
 - Assess the significance of residual effects remaining following the implementation of mitigation.
- 10.1.5 The assessment has been carried out by Avian Ecology Ltd. Lead authors: Mr Howard Fearn MSc MCIEEM, Director, Ms Nicole Robinson BSc (Hons) MSC ACIEEM, Principal Ornithologist, and Dr Colin Bonnington DPhil BSc (Hons) MCIEEM, Senior Ecologist. Mr Fearn, Ms Robinson and Dr Bonnington have over 18- and ten-years' experience (both

¹ The term 'important ornithological receptors' used in this chapter is equivalent to the term 'important ornithological features' used in the CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018), and can refer to species and/or ecosystems and their functions or services.

Nicole and Colin) respectively as professional ecologists, specialising in renewable energy developments. During this time, they have carried out impact assessments and information to inform Appropriate Assessment (AA) for Habitats Regulations Assessment (HRA) for ornithological interest at multiple onshore wind developments, repowers and life extensions and have also carried out technical review and quality assurance of Environmental Statement chapters written by others.

10.1.6 This chapter is supported by the following figures:

- Figure 10.1: Ornithological Statutory Designated Sites;
- Confidential Figure C10.1: Existing Ornithological Records (Sensitive);
- Confidential Figure C10.2: Breeding Raptor Survey Results (Sensitive);
- Figure 10.2: Existing Ornithological Records (Non-Sensitive);
- Figure 10.3: Vantage Point Flight Activity Survey Plan;
- Figure 10.4: Breeding Bird Survey Plan;
- Figure 10.5a: Target Species Flight Activity (Year 1);
- Figure 10.5b: Target Species Flight Activity (Year 2);
- Figure 10.6: Moorland Breeding Bird Survey Results (Year 1);
- Figure 10.7a: Nightjar Survey Results (Year 1);
- Figure 10.7b: Nightjar Survey Results (Year 2);

10.1.7 This chapter is supported by the following technical appendices:

- Appendix 10.1: Ornithology;
- Confidential Appendix C10.1: Ornithology;
- Appendix 10.2: Collision Risk Model Analysis.

10.1.8 Figures and technical appendices, including those of other chapters, are referenced in the text where relevant. Only common bird species names are used within this chapter; a summary of bird species including common names, scientific names and relevant conservation status' are provided in the Appendix 10.1.

10.1.9 The assessment of potential effects upon non-avian ecological receptors is presented separately in Chapter 9: 'Ecology'. Note that in the interests of concision, information contained in other chapters and appendices is not repeated herein unless essential for understanding and is instead cross referred to within this chapter.

10.1.10 The term 'Site' referred to within this Chapter, is defined by the red line Site boundary shown on Figures 10.1 to 10.7.

10.2 Policy Context

10.2.1 The following key pieces of legislation have been taken into account as part of this assessment:

- The Conservation of Habitats and Species Regulations 2017, as amended d by the Conservation (Natural Habitats, &c.) (EU Exit) (Amendment) Regulations 2019 (collectively ‘the Habitats Regulations’²);
- The Environment (Wales) Act 2016³;
- the Wildlife and Countryside Act 1981 (as amended⁴);
- Planning Policy Wales 11 (2021) - Chapter 6 Distinctive and Natural Places;
- Technical Advice Notes 5 (2009) – Nature Conservation and Planning;
- Nature Recovery Action Plan (2020).

10.2.2 The following key pieces of policy have been taken into account as part of this ornithology assessment:

- Neath Port Talbot Local Development Plan 2011-2026 (2016); and
- Neath Port Talbot Biodiversity Duty Plan (2021).

10.2.3 The following key pieces of industry guidance have been taken into account as part of this ornithology assessment, and which in the absence of specific guidance in relation to the impact assessment of wind farms on bird species in Wales, includes reference to current NatureScot (formerly Scottish Natural Heritage) guidance:

- Assessing Connectivity with Special Protection Areas (NatureScot, 2016a);
- Assessing the Cumulative Impacts of Onshore Wind Farms on Birds (NatureScot, 2018a);
- Assessing the Significance of Impacts from Onshore Wind Farms outwith Designated Areas (NatureScot, 2018b);
- Fifth Birds of Conservation (Stanbury *et al.*, 2021);
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information: Guidance for Developers, Consultants and Consultees (NatureScot, 2016b);
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018);
- Windfarms and Birds – Calculating a Theoretical Collision Risk Assuming No avoiding Action (NatureScot, 2000);
- Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms (NatureScot, 2017);
- Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model (NatureScot, 2018c) and

² The Habitats Regulations <https://www.legislation.gov.uk/ukdsi/2019/9780111176573>.

³ The Environment (Wales) Act 2016 <https://www.legislation.gov.uk/anaw/2016/3/contents/enacted>.

⁴ The Wildlife and Countryside Act 1981 (as amended) <https://www.legislation.gov.uk/ukpga/1981/69>.

- General pre-application and scoping advice for onshore wind farms (NatureScot, 2020).
- 10.2.4 Note that only items with specific relevance to ornithology are listed above; general legislation and planning policy relevant to the proposed development are detailed in Chapter 5: 'Policy Context'.

10.3 Assessment methodology

Scope of Assessment

- 10.3.1 The assessment presented within this Chapter has been undertaken in accordance with CIEEM guidelines (2018) and considers the following potential impacts upon ornithological receptors associated with construction, operation and decommissioning of the Proposed Development:
- Collision mortality – the risk of mortality resulting from collision or interaction with the turbines and/ or other wind farm infrastructure; and
 - Disturbance/ displacement of species - disturbance and displacement of birds from the area occupied by the Proposed Development and surrounding areas as a result of the Proposed Development.
- 10.3.2 The potential effects are considered as a result of the Proposed Development alone and cumulatively, in-combination with other wind farm developments which are the subject of a valid planning application. Operational, under construction and consented wind farm developments are considered for the cumulative impact assessment. Developments close to the end of their operational life will be included as part of the cumulative assessment to present 'worst case scenario'. Note, where relevant, notable non-wind developments are also considered in the cumulative assessment.
- 10.3.3 CIEEM guidelines (2018) stipulate that it is not necessary to carry out a detailed assessment of impacts upon ornithological receptors that are sufficiently widespread, unthreatened and resilient to impacts of the proposed development. As such, the assessment considers effects upon designated sites and ornithological receptors which are considered 'important' on the basis of baseline information, relevant guidance, literature, professional judgement of the authors and opinions of statutory advisory bodies provided through consultations in relation to the Proposed Development and, where relevant, other wind farm developments.
- 10.3.4 Where ornithological receptors are not considered so important as to warrant a detailed assessment, or where they would not be significantly affected on the basis of baseline information (e.g., passerine species), these are 'scoped out' of the assessment. Mitigation measures for such receptors may, however, still be outlined as appropriate to reduce and/ or avoid any potentially adverse effects or to ensure legislative compliance e.g., for breeding and roosting birds.
- 10.3.5 The assessment is based on the Proposed Development described in Chapter 4: Proposed Scheme, Alternatives, and has been undertaken in recognition of design evolution and embedded mitigation measures, as detailed in full within Chapter 4, and standard practices and construction environmental management included within the Outline Construction Environmental Management Plan (OCEMP), Appendix 4.1.
- 10.3.6 The scope of the assessment has been informed by consultation responses summarised in Table 10.1 and key legislation, policy and guidance below.

Predicting effects

10.3.7 The assessment has been undertaken in accordance with CIEEM guidelines (2018) and includes the following stages:

- Determination and evaluation of important ornithological receptors;
- Identification and characterisation of impacts;
- Outline of mitigating measures to avoid and reduce significant impacts;
- Assessment of the significance of any residual effects after such measures; and
- Identification of appropriate compensation measures to offset significant residual effects.

Criteria for Assessing the Sensitivity of Receptors

10.3.8 Relevant European, national and local guidance from governments and specialist organisations has been referred to in order to determine the sensitivity (or importance) of ornithological receptors. In the absence of Welsh-specific guidance reference has also been made to Annex 1 of NatureScot guidance (2017) on key ornithological receptors when considering the development of onshore wind farms and species with 'restricted ranges' potentially at risk of impacts from wind farms.

10.3.9 In addition, importance or sensitivity has also been determined using professional judgement and taking account of the results of baseline field and desk study findings and the functional role of receptors within the context of the geographical area.

10.3.10 It should be noted that importance does not necessarily relate to the level of legal protection that a receptor receives, and ornithological receptors may be important for a variety of reasons, such as their connectivity to a designated site, rarity or the geographical location of species relative to their known range.

10.3.11 For the purposes of this assessment the sensitivity or importance of an ornithological receptor is considered ranging from Very high to Negligible, as detailed in Table 10.1.

Table 10.1 Value/sensitivity assessment

Receptor value / sensitivity	Receptor type
Very High	An internationally designated site i.e., Special Protection Area (SPA) and/or Ramsar site or candidate/potential site (pSPA). A regularly occurring species present in internationally important numbers (>1% of its biogeographic population) listed under Annex I of the Birds Directive, or regularly occurring migratory species listed under Annex II of the Birds Directive connected to an internationally designated site for this species.
High	A nationally designated site e.g., Site of Special Scientific Interest (SSSI), or area meeting criteria for national level designations. A regularly occurring species present in nationally important numbers (>1% of its Welsh population) and listed as a UK Biodiversity Action Plan (BAP), Section 7 priority species, Red-listed BoCC (Stanbury <i>et al.</i> , 2021) or listed under Schedule 1 of the Wildlife & Countryside Act 1969, or Annex 1 of the Birds Directive.

Receptor value / sensitivity	Receptor type
Medium	A regularly occurring species present in regionally important numbers (>1% of the regional estimate, or appropriate alternative) and listed as a UK BAP, Section 7 priority species, Red-listed BoCC (Stanbury <i>et al.</i> , 2021) or listed on Schedule 1 of the Wildlife & Countryside Act or Annex 1 of the Birds Directive.
Low	All other species that are widespread and common and which are not present in regionally or nationally important numbers, but which do contribute to the local breeding/wintering bird assemblage.
Negligible	All other species that are widespread and common and which are not present in regionally, nationally or locally important numbers.

Criteria for Assessing the Magnitude of Change

- 10.3.12 Once identified, potential effects are described making reference to the following characteristics as appropriate:
- Adverse or beneficial;
 - Extent;
 - Magnitude;
 - Duration;
 - Timing;
 - Frequency; and
 - Reversibility.
- 10.3.13 The assessment only makes reference to those characteristics relevant to understanding the nature of an effect and determining its significance. For the purposes of this assessment the temporal nature of potential effects are described as follows:
- Negligible: of inconsequential duration;
 - Short-term: for 1-5 years;
 - Medium-term: for 5-10 years;
 - Long-term: >10-30 years; and
 - Permanent: >30 years.
- 10.3.14 The criteria used to determine the magnitude of impacts are set out in Table 10.2.
- 10.3.15 It is important to note that, where reference is made to population level effects to assess magnitude the most recently published available population estimates used are considered to be guides.
- 10.3.16 In addition, it will often be impossible to equate an impact to an actual population loss. For example, where birds may be displaced from a wind farm site as a result of construction or operational activities, such a loss may be temporary or may reasonably result in the relocation of birds to suitable, elsewhere within the site, immediate or wider area. Where uncertainty arises, a precautionary approach has been adopted.

- 10.3.17 As such, professional judgement, on the basis of best available evidence, has been used to inform the assessment of impacts presented within.

Table 10.2 Magnitude of impact

Magnitude	Description
Very High	The effect (either on its own or in-combination with other proposals) may result in the permanent total or almost complete loss of a site and/or species status or productivity. E.g., Affecting >80% of the regional population estimate (or appropriate alternative).
High	The effect (either on its own or in-combination with other proposals) may adversely affect the conservation status of a site and/or species population, in terms of the coherence of its ecological structure and function (integrity), across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest. E.g., Affecting 30%-80% of the regional population estimate (or appropriate alternative).
Medium	The effect (either on its own or in-combination with other proposals) would not adversely affect the conservation status of a site and/or species, but some element of the functioning might be affected, and impacts could potentially affect its ability to sustain some part of itself in the long term. E.g., Affecting >10%-30% of the regional population estimate (or appropriate alternative).
Low	Neither the above or below applies, but some observable adverse effect is evident on a temporary basis or affects extent of habitat/species abundance in the local area. E.g., Affecting 1%-10% of the regional population estimate (or appropriate alternative).
Negligible	A very slight (indiscernible) reduction in a site and/or species status or productivity and/or no observable effect. e.g., Affecting <1% of the regional population estimate (or appropriate alternative).

Criteria for Assessing Cumulative Effects

- 10.3.18 Potentially significant cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location.
- 10.3.19 Cumulative impacts have therefore been assessed with reference to NatureScot guidance (2018a) for important ornithological receptors subject to a detailed assessment.
- 10.3.20 The cumulative assessment includes consideration of:
- Existing wind farm developments, either operational or under construction;
 - Consented wind farm developments, awaiting implementation; and
 - Wind farm applications awaiting determination within the planning process with design information in the public domain.
- 10.3.21 Those developments which have been withdrawn and/or refused are not considered. Furthermore, those wind farm developments at the screening stage are not considered as no information relevant to the cumulative effects is available for these projects.
- 10.3.22 Whilst single or small-scale wind turbine developments may contribute to cumulative effects, these have been scoped out of assessment as applications for such developments do not generally consider the potential for impacts upon ornithological receptors in sufficient detail so as to enable meaningful assessment.
- 10.3.23 For the Proposed Development, red kite was the only species which were recorded in sufficient number to warrant collision risk mortality modelling. As detailed in Table 10.5, cumulative assessment has only been undertaken for red kite in this chapter. Given 6km is the maximum documented foraging range for the species (NatureScot, 2016a), wind farms (and notable non-wind farm developments) within 10km of the Proposed Development are considered in the cumulative assessment (see Figure 3.1), and this considered a precautionary worst-case scenario approach.

Criteria for Assessing Significance

- 10.3.24 CIEEM guidelines (2018) note that:
- "A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects have been lawfully permitted following EIA procedures."*
- 10.3.25 For the purposes of this assessment significant effects are therefore identified as those which encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).
- 10.3.26 Such effects are identified by considering the importance of a receptor, the magnitude of the effect and applying professional judgement based on best available evidence, to identify whether the integrity of a receptor would be affected.
- 10.3.27 The term 'integrity' is used here to refer to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

- 10.3.28 For the purposes of this assessment, significant effects are primarily expressed with reference to an appropriate geographical scale.
- 10.3.29 For the purposes of this assessment, significant effects are primarily expressed based on Welsh population estimates, and where available regional estimates provide sufficient information allows a meaningful assessment.
- 10.3.30 In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed as a precautionary approach. Where uncertainty exists, this is acknowledged.
- 10.3.31 Where the assessment proposes measures to mitigate adverse effects on ornithological receptors, a further assessment of residual effects, taking into account such measures, has been undertaken.
- 10.3.32 CIEEM guidelines (2018) do not recommend the sole use of a matrix table as commonly set out in ES Chapters to determine 'significant' and 'non-significant' effects. For the purposes of this assessment presented herein, Table 10.3 sets out adapted CIEEM terminology and equivalent in the context of the EIA Regulations.
- 10.3.33 Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 10.3 Level of effect

Significance		
Significant	Major Adverse/Beneficial	A medium or high, medium or long-term adverse or beneficial effect upon the integrity of an ornithological receptor at a National (Welsh) or International level.
	Moderate Adverse/Beneficial	A high or very high, long-term or permanent adverse or beneficial effect upon the integrity of an ornithological receptor at a regional level (or suitable alternative) or above.
Non-significant	Minor Adverse/Beneficial	A low or medium, short-term or long-term adverse or beneficial effect upon the integrity of an ornithological receptor at a regional level (or suitable alternative) or below.
	Negligible/Beneficial	A negligible or low adverse or beneficial effect upon the integrity of an ornithological receptor, typically at a site level or below.

Requirements for Avoidance, Mitigation, Compensation and Enhancement

- 10.3.34 The mitigation hierarchy has been adopted to avoid, mitigate and compensate for potential ornithological impacts as a result of the Proposed Development:
- Avoidance is used where an impact has been avoided e.g., through changes in Proposed Development design;
 - Mitigation is used to refer to measures to reduce or remedy a specific adverse impact in situ;
 - Compensation describes measures taken to offset residual effects, i.e., where mitigation in situ is not possible; and

- Enhancement is the provision of new benefits for biodiversity that are additional to those provided as part of mitigation or compensation measures, although they can be complementary.

10.3.35 Note that in this chapter these are referred to collectively as ‘mitigation’ for brevity when discussing generalities, though with the form of mitigation specified as appropriate in discussion of any specific requirements

Consultation

10.3.36 Table 10.4 summarises the consultation responses received regarding ornithology and provides information on where and/ or how they have been addressed in this assessment. To avoid repetition, information contained elsewhere in the chapter is only briefly summarised in Table 10.4, with cross references given to where in the chapter further information is provided.

Table 10.4 Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
Natural Resources Wales (NRW) (20th May 2022 & 7th July 2022)	Scoping	Note that although two years of ornithology survey have been undertaken in the MFD area of the Proposed Development (eastern land as shown in Figures 10.3 and 10.4), only one year of ornithology survey has been undertaken in the MB area of the Proposed Development. NRW agree in part to the rationale why the level of survey effort carried out is proportionate for the assessment (the MB area is being planted largely with commercial forestry), but the changing baseline in MB area should be considered in the assessment.	Explanation is provided in Appendix 10.1. The MB area (western land as shown in Figures 10.3 and 10.4) is of relatively limited ornithology value (as determined from baseline information gathering), with no suitable features for establishing breeding Annex 1/Schedule raptors. Furthermore, given the Study Areas used during Year 1 surveys (out to 2km) the MB area was at least covered during Breeding Raptor and Owl searches. The MB area is also subject to forestry planting, and therefore the ornithological baseline may change in the future (this is addressed in section 10.4). It is therefore considered that the baseline information gathered is proportionate and

Consultee and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		Species on Section 7 of the Environment (Wales) Act 2016 should be included in the target species surveys. The Applicant can find additional guidance within the Welsh Bird Reports, and the Welsh Scarce and Rare Bird Report (both produced by the Welsh Ornithological Society) to assist in the submission of information. Stated that all information redacted in the scoping report must be included in the assessment (to include nesting Schedule 1 raptor records).	provides a robust baseline for the purpose of impact assessment (within this chapter). Section 7 species were considered during the baseline information gathering (see Appendix 10.1). Effects on passerine species within Section 7 are however scoped out of detailed assessment given the populations of such species are not considered sensitive to wind farm developments (see NatureScot, 2017). The Welsh Ornithological Society were approached for the latest population estimates for red kite (given this was the only species that warranted detailed assessment). See correspondence details in this table, with red kite estimates used using the latest published information. Noted. All baseline information used in the assessment is provided in Appendix 10.1, or in relation to sensitive information, in the Confidential C10.1 and which will be provided to NRW.
Neath Port Talbot County Borough Council (NPTCBC) (30th May 2022)	Scoping	Information regarding ornithology should be sought from the South East Wales Biodiversity Records Centre (SEWBRc).	Noted, and information has been gathered from SEWBRc, with information provided

Consultee and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		The effects on ornithology receptors from the solar farm array component of the Proposed Development should be included in the assessment. Justification is needed to be provided in the assessment, for the reason why one year of ornithology survey data for the MB area of the Proposed Development is appropriate. Within the assessment, consideration is needed for the changing baseline in the MB area (forestry planting) in terms of potentially making that area of the Site, more suitable for some species, such as nightjar. All aspects of the Proposed Development should be considered within the cumulative assessment to include access corridor, solar arrays and wind farm (and associated infrastructure).	in Appendix 10.1 and Confidential Appendix C10.1. The solar farm array component is regarded as part of the Proposed Development in its entirety. Study Areas used for the Proposed Development have therefore included the solar farm and the assessment (in this chapter) therefore robustly covers effects of the solar farm on ornithology receptors. Explanation is provided in the response to NRW in this table. Noted, and this is considered in section 10.4. The Proposed Development in its entirety is considered within the cumulative assessment (see section 10.10). The exception to this is the grid connection, which given it's localised and temporary nature (with habitats reinstated and no discernible habitat loss) is considered separately in section

Consultee and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
			10.11, where effects on ornithology receptors is assessed as negligible, so its contribution to the cumulative effects is considered inconsequential.
Planning and Environment Decisions Wales (PEDW) (24th June 2022)	Scoping	Note that part of the Site (MB area) has only been subject to one year of ornithology surveys. If the assessment is based on such survey data, the assessment should include a robust justification as to why this is considered appropriate. Recommends consultation with relevant consultees to ensure the survey effort is appropriate for assessment. Requested that details of how the collision risk modelling (CRM) is carried out should be included, and engagement sought with NRW for their agreement.	Explanation is provided in the response to NRW in this table. NRW and NPTCBC have been consulted and have confirmed that justification will need to be provided in the assessment into why one year of ornithology is proportionate. NRW also stated in their correspondence that they agreed with the rationale as to why one year of ornithology survey in the MB area is proportionate in principle. Full details of the CRM undertaken are presented in Appendix 10.2. The methodology followed standard NatureScot guidance for CRM for wind farms (see Appendix 10.2 for methodology). The details of how the CRM was undertaken was issued as a letter to NRW on 14th September 2022.

Consultee and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		Cumulative impacts within the area may be significant. It is not possible for PEDW to make recommendations for the approach to mitigation. However, wind farms should not have an unacceptable adverse impact on the environment, and such projects should bring a net benefit to the environment.	Cumulative effects are considered in section 10.10. Noted. Effects on ornithology by the Proposed Development are fully considered in the assessment in this chapter. Table 10.3 sets out adapted CIEEM terminology and equivalent in the context of the EIA regulations, with major and moderate effects considered significant. Habitat measures to be adopted are summarised in section 10.7 and provided in the OHMP (Appendix 9.4).
Welsh Ornithological Society (2nd November 2022)	Post-Scoping, information sought for assessment	Provided references to latest red kite estimates in Wales.	Noted, and used in the assessment in this chapter.
NRW (23rd January 2023)	Pre-Application Consultation	Confirmed they agree with rationale given for the single year of ornithology surveys on the MB area and characterisation of future ornithological baselines. Questioned why no winter walkover surveys conducted and why no justification provided. Noted later start times to MBBS in Year 1 and asked for clarity on whether this would likely affect results.	Noted. Justification for the omission of winter walkover surveys is provided in Appendix 10.1 Justification for start times to MBBS are provided in Appendix 10.1 and were timed to cover the optimal period when target species for the survey would be most active.

Consultee and Date	Scoping/Other Consultation	Issues Raised	Response/ Action Taken
		Questioned what 'x' referred to in Table 3.3. in Appendix 10.1, and whether values could be provided.	The paragraph above Table 3.3 in Appendix 10.1. states what 'x' means and provides justification why actual values are not provided (because passerines are not considered sensitive to wind farm developments and surveys are not recommended for such species, in accordance with standard guidance; NatureScot, 2017).

Assumption and Limitations

- 10.3.37 Limitations are discussed in full within Appendix 10.1. In summary no limitations to baseline information gathering and subsequent assessment herein presented have been identified.
- 10.3.38 All habitats within the Site were accessible for survey. Access to and observations of areas outside the Site was possible from suitable locations within the site or public rights of way (PRoWs), scanning areas with the use of optics (telescope and binoculars).

10.4 Baseline conditions

Current Baseline

- 10.4.1 This section provides a summary of baseline ornithological conditions.
- 10.4.2 The Site comprises principally of acid and neutral grassland, with marshy grassland the dominant habitat on the higher ground in the MB area (for further details see Appendix 9.1). In the wider area are large areas of commercial forestry, grazed grassland, and Pen y Cymoedd to the east of the Site. As detailed in the 'Future Baseline' within this section, the MB area has been consented for planting of forestry, and the effect of this planting on the future baseline in relation to ornithology is considered.
- 10.4.3 This section provides an overview of the Proposed Development's proximity to designated sites for nature conservation with ornithological interests, together with the known distribution and flight activity of target species.
- 10.4.4 Full details are provided within Appendix 10.1, with information that is considered sensitive presented in Confidential Appendix C10.1.

Designated Sites for Nature Conservation

- 10.4.5 This section should be read with reference to Figure 10.1 and Appendix 10.1.
- 10.4.6 Three designated sites for nature conservation with qualifying ornithological interest are located within 10km of the Site:
- Crymlyn Burrows Site of Special Scientific Interest (SSSI) (8.3km west from the Site) - overwintering wader interest;
 - Mynydd Ty-Isaf SSSI (8.7km east from the Site) - un-named Schedule 1 breeding raptor interest; and
 - Crymlyn Bog Ramsar site and SSSI (9.5km west from the Site) - important populations of reed warbler and sedge warbler interests.
- 10.4.7 There are no additional internationally designated sites i.e., Special Protection Areas (SPAs) or Ramsar sites (European sites) located within 20km of the Site and with which potential connectivity may be considered in accordance with NatureScot guidance (2016a).
- 10.4.8 There are three non-statutory designated sites within 1km of the Site: Tyle'r Waun Site of Interest for Nature Conservation (SINC), Cwm Blaenpelenna SINC and Tonmawr Minewater Treatment & Surrounding Habitats SINC. Tyle'r Waun SINC is within the Site, Cwm Blaenpelenna SINC is adjacent to part of the northern Site boundary and Tonmawr Minewater Treatment & Surrounding Habitats SINC is located to the west of the Site. None of these SINC's list ornithology as qualifying features.

Existing Ornithological Records (Desk Study)

- 10.4.9 Existing ornithological records within proximity to the Proposed Development were obtained from SEWBRc. A review of operational monitoring from the adjacent Pen y Cymoedd Wind Farm (Planning Ref: P2009/1053) and baseline ornithological surveys carried out by Avian Ecology Ltd. of the MFD area of the Proposed Development between March 2015 and February 2016 was also undertaken.
- 10.4.10 Detailed desk study results are presented in Appendix 10.1 and Figure 10.2, with records considered sensitive presented in Confidential Appendix C10.1 and associated Confidential Figure C10.1.
- 10.4.11 The SEWBRc provided records of 30 species, including barn owl, hen harrier, peregrine and honey-buzzard. No records related to the presence of breeding sites of such species within 1km of the Site.
- 10.4.12 A review of Pen y Cymoedd operational monitoring reports identified the presence of breeding nightjar and very low flight activity of honey-buzzard associated with the Proposed Development Site and surrounding area (with sporadic evidence of breeding typically >4km from the locality, and no breeding evidence at all during the most recent monitoring (MPS Ecology, 2021)).
- 10.4.13 Surveys of the MFD area of the Proposed Development between March 2015 and February 2016 by Avian Ecology Ltd., recorded churring (seven) nightjar to the east of the Site boundary, and typically low flight activity of a narrow range of raptors and owls, including red kite, peregrine and merlin. Of the species recorded during VP flight activity surveys, only red kite (17) was recorded with more than two flights.

Vantage Point (VP) Flight Activity Surveys

- 10.4.14 Vantage Point (VP) flight activity surveys were carried out in accordance with NatureScot guidance (2017), and the VP Study Area comprised the Proposed Development's turbines plus 500m. Flight activity of target species were recorded during the survey period.
- 10.4.15 VP flight activity surveys to establish the level and distribution of potential "at collision risk" target species flight activity were undertaken between March 2019 and February 2020 (Year 1) and between March 2021 and February 2022 (Year 2).
- 10.4.16 Surveys adopted one VP location in Year 1 between and two VP locations in Year 2 (Figure 10.3) and which have provided visual coverage of the VP Study Area.
- 10.4.17 Full details of surveys, including survey effort and viewshed visibility coverage of the VP Study Area are detailed within Appendix 10.1. Survey effort was at least 80 VP hours in each survey year, which exceeded the minimum number of hours required in NatureScot guidance (2017).
- 10.4.18 Target species flight activity recorded during surveys is detailed in Appendix 10.1 and illustrated in Figures 10.5a and b. For the purposes of assessment using the NatureScot Collision Risk Model (CRM) (Band *et al.*, 2007) "at collision risk" flight activity has been identified as those flights occurring at, or in part, between 50m and 200m above the ground for the MFD area and between 30m and 180m for the MB area (given the turbine heights in the Proposed Development), and within 290m of proposed turbine locations. Details of all target species flights considered to be "at collision risk" together with collision mortality risk calculations using the NatureScot CRM (Band *et al.*, 2007) are provided in Appendix 10.2.
- 10.4.19 Detailed analysis of collision mortality risks using the NatureScot CRM (Band *et al.*, 2007) has only been undertaken for red kite, given this was the only target species for which four or more "at collision risk" flights were recorded in any one survey year. Accordingly, collision mortality risks for all other target species recorded during baseline surveys can be concluded as inconsequential at any population level without the requirement for detailed analysis.
- 10.4.20 Predicted annual collision mortality risks for red kite as a result of the Proposed Development is estimated as 0.323 birds (combined estimates for MFD and MB areas using Year 2 flight activity data).
- 10.4.21 In Year 1, only the MFD area was subject to survey, with estimated annual collision mortality risks calculated as 0.159 birds.
- 10.4.22 As the 'MFD only' estimate using Year 1 data is lower than the respective estimate using Year 2 data, the predicted collision mortality of 0.323 birds calculated using the Year 2 dataset for the MFD and MB areas combined, is considered the worst-case scenario and which is adopted for the purposes of assessment.
- 10.4.23 There is currently no evidence that estimates of collision mortality risks calculated using the NatureScot CRM are realised in actual mortality events at onshore wind farms in Wales, although the potential occurrence of bird collisions cannot be entirely precluded.

Moorland Breeding Bird Surveys

- 10.4.24 Moorland breeding bird surveys (MBBSs) were undertaken in 2019 and 2021, following an adapted Brown and Shepherd (1993) methodology for the census of upland breeding waders, in accordance with NatureScot guidance (2017).
- 10.4.25 The Study Area comprised the Site plus a 500m buffer in 2021 (and the MFD area plus 500m in 2019), where accessible, in accordance with NatureScot guidance (2017).
- 10.4.26 During survey in 2019 and 2021, only a narrow assemblage of breeding passerines was recorded, with no breeding ground-nesting waders or waterfowl recorded. Most breeding passerines recorded within the Site are species which are associated with habitats including woodland, hedgerows and treelines (see Figure 10.6).
- 10.4.27 Full details of surveys, including survey effort and species recorded are provided in Appendix 10.1.
- 10.4.28 Populations of passerine species are not considered to be significantly impacted by onshore wind farms (NatureScot, 2017 and 2018), with the potential for significant effects upon such species scoped out of detailed assessment. All breeding birds will be considered through the adoption of good practice measures (summarised in section 10.5), to ensure nesting birds, including the nests of passerines are protected during works associated with the Proposed Development.
- 10.4.29 The solar array component of the Proposed Development has a relatively small footprint (~10 ha) and is located on semi-improved acid grassland. Ground-nesting passerines (like skylark) recorded during the surveys, are reported as using habitats within solar farms, and there is little evidence for permanent displacement of birds by solar farms (RSPB, 2020). It is therefore considered that species like skylark will continue to use grassland habitats associated with the solar array. Furthermore, some measures outlined in the OHMP (Appendix 9.4, such as scrub clearance) are likely to enhance nesting and foraging habitat for ground-nesting passerines. The solar array is proposed in the MB area, and given some of the MB area is consented for forestry planting, there is likely to be a reduction of open grassland habitat for ground-nesting passerines (see 'Future Baseline' section), so therefore the solar array (and surrounding grassland habitat) may continue to provide nesting and foraging opportunities for some species, while much of the MB area with time (as forest matures), will become largely unsuitable.

Annex 1 / Schedule 1 Breeding Raptor and Owl Searches

- 10.4.30 Annex 1/Schedule 1 breeding raptor and owl searches were undertaken in 2019 and 2021, following methodologies in Hardey *et al.* (2013) in accordance with NatureScot guidance (2017).
- 10.4.31 The Study Area comprised the Site plus a 2km buffer in 2021 (and the MFD area plus 2km in 2019), where accessible, in accordance with NatureScot guidance (2017).
- 10.4.32 In 2019, the Study Area was found to support a single red kite breeding territory, but which was not present in 2021.
- 10.4.33 Information pertaining to the locations of the breeding sites of Schedule 1 breeding raptor species are considered sensitive and is therefore restricted to Confidential Appendix C10.1 and Confidential Figure C10.2.

Nightjar Surveys

- 10.4.34 Nightjar surveys were undertaken in 2019 and 2021 following the methodology in Gilbert *et al.* (1998) in accordance with NatureScot guidance (2017).
- 10.4.35 The Study Area comprised the Site plus a 500m buffer in 2021 (and the MFD area plus 500m in 2019), where accessible, in accordance with NatureScot guidance (2017).
- 10.4.36 In 2019, two churring nightjar males were recorded within the Study Area, to the east of the Site (within clear-fell), together with a single bird in flight (see Figures 10.7a and 10.7b for survey results).
- 10.4.37 In 2021, three churring males and another bird flight were recorded within the Study Area.
- 10.4.38 Similarly, to 2019, nightjar recorded in 2021 were associated with plantation forestry and/or clear-fell adjoining the Site boundary.
- 10.4.39 In 2019 and 2021, all churring males were recorded in suitable breeding habitats outside the Site, at least 150m from the nearest Proposed Development turbine. The Site itself is not considered suitable for nightjar breeding/nesting.

Future Baseline

- 10.4.40 In the absence of the Proposed Development, assuming a “do-nothing” scenario or gap between baseline surveys and the commencement of construction of the Proposed Development, changes in the baseline ornithology conditions (i.e. distributions and populations) of the Site are most likely to result from habitat modifications within, or surrounding, the Site due to local land management practices, principally, forestry works surrounding the Site and livestock grazing in most open habitats within the Site.
- 10.4.41 For the MFD area of the Site this is likely to be small-scale, localised changes to the existing habitats and therefore breeding bird densities would reasonably be expected to remain at comparable levels with those recorded during field surveys and identified through desk study i.e., at relatively low levels, albeit central territory locations may shift.
- 10.4.42 The establishment of additional breeding raptor territories within the MFD area of the Site is considered unlikely, given the general absence of suitable nesting habitat features for other raptor species including hen harrier, short-eared owl, peregrine and merlin (such as deep heather swards and crags).
- 10.4.43 For the MB area, the whole of the plateau and the slopes down to the site boundary at Bryngwyneithlen Row is consented for forestry planting (principally commercial plantations). Of this wider block, a proportion has been awarded a Glastir grant and has already been planted. Should the proposed wind farm not be consented, the areas not already planted will be planted, which will result in more notable changes to the existing habitats in some parts of the MB area (see Figure 2.3). The conversion of some of the MB area from open grassland habitat to forestry will reduce the suitability for some species (ground-nesting species), but is likely to increase suitability for other species (such as nightjar). However, given the Proposed Development's turbines will be more than 100m from the new forestry plantations, and because nightjar are not documented to be displaced from operational wind farms, with nightjar recorded as nesting within 60m of turbines (BSG Ecology, 2017), adverse interactions between any species that are attracted into the MB area (like nightjar) and the Proposed Development's turbines are considered unlikely.

- 10.4.44 Furthermore, forestry with age may provide suitable nesting habitat for raptors including red kite and goshawk (although this is likely to be late in the Proposed Development's lifespan, given the time taken for trees to grow to an appropriate height for nesting). The forestry plantations are considered to be a sufficient distance (at least 100m) from the Proposed Development's turbines, whereby adverse effects on establishing raptors are unlikely. Given the relatively small area of forestry that has been planted (see Indicative Glastir Woodland Planting shown on Figure 2.3) compared to the habitat to be retained, any change in breeding bird densities (either increasing or decreasing) is considered only likely to be modest, although there may be small-scale changes to central territory locations.

10.5 Inherent Design Mitigation

Embedded Mitigation

- 10.5.1 The Proposed Development has been subject to a number of design iterations and evolution in response to constraints identified as part of the baseline studies, intended to reduce environmental effects (see Chapter 4: Proposed Scheme, Alternatives for further details).
- 10.5.2 Design considerations have been incorporated to avoid or minimise adverse effects upon ornithological receptors, as set out below.
- 10.5.3 Design of the Proposed Development is sensitive to those bog/flush/marsh habitats in the east of the Site (within the Tyle'r Waun Site of Importance for Nature Conservation (SINC); see Appendix 9.1 for further details), with the Proposed Development's turbines located predominantly in livestock grazed grassland in the MFD area.
- 10.5.4 Furthermore, the layout of infrastructure (e.g., wind turbines, tracks and substation) has sought to avoid areas of deep peat, minimising the potential for impacts to habitat types with greater future restoration potential (within the Tyle'r Waun SINC).
- 10.5.5 The Proposed Development's turbines are also offset from forestry by at least 100m, so there is considerable spatial separation from turbines and forest (which has potential to be used by breeding raptors).
- 10.5.6 Turbines have also been located >300m from the nearest red kite nest site (identified in 2019, but not active in 2021) and which is beyond the suggested upper disturbance buffer zones in accordance with NatureScot guidance (300m in Goodship and Furness, 2022).
- 10.5.7 The only exception to this is one turbine which is located within the suggested upper disturbance buffer zone of the active red kite nest site identified in 2019, but beyond the suggested minimum disturbance buffer zone in accordance with NatureScot guidance (150m in Goodship and Furness, 2022). Adopting a precautionary approach, the potential for disturbance effects to breeding red kite pairs, which may choose to use the identified nest site in subsequent years, is considered possible.
- 10.5.8 Standard 'Good Practice Measures' have therefore been embedded to enable legislative compliance with regards to breeding red kites.

Good Practice Measures

- 10.5.9 The construction phase of the Proposed Development will be undertaken in accordance with a Construction Environmental Management Plan (CEMP), and which will be finalised in consultation with Neath Port Talbot County Borough Council (NPTCBC) and Natural Resources Wales (NRW) on the basis of the Outline Construction Environmental

Management Plan (OCEMP) presented as Appendix 4.1 and which includes measures relevant to ornithology receptors summarised below.

- 10.5.10 Works under the CEMP would be implemented under the supervision of an appointed Environmental Clerk of Works (ECoW).
- 10.5.11 All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended), which makes it an offence to intentionally or recklessly kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs. In addition, all wild birds listed on Schedule 1 of the Act (including red kite) receive additional legal protection which makes it an offence to intentionally or recklessly disturb these species while building a nest or are using or near a nest containing eggs or young; or to disturb their dependent young.
- 10.5.12 Prior to the commencement of construction activities, the CEMP will include for the preparation of a Construction Breeding Bird Protection Plan (CBBPP) and which would be submitted for agreement in consultation with NPTCBC and NRW.
- 10.5.13 The CBBPP would be informed by a pre-commencement breeding bird survey to establish the status and distribution of Schedule 1 breeding birds within the Site and within 300m of disturbing activities.
- 10.5.14 The CBBPP would detail the following measures and any additional measures required on account of findings from the pre-commencement breeding bird survey, to enable the protection of breeding birds over the course of construction works during the breeding season is updated to reflect best available species guidance applicable at the time.

Site Clearance Activities

- Habitat clearance activities, where these coincide with the breeding bird season (1st March to 31st August, inclusive) would be subject to a pre-clearance survey by a competent ornithologist to identify any active wild bird nests. Should any active nests be found, works would only proceed under the advice of the appointed ornithologist and following a disturbance risk assessment. This would include all works within the Site.
- Work exclusion buffers around identified nest sites would be implemented where necessary in accordance with current NatureScot guidance (Goodship and Furness, 2022) or best available species guidance applicable at the time and/ or as agreed in consultation with NPTCBC and NRW. No works would be permitted within the implemented exclusion zone until where otherwise advised by the ECoW.

Schedule 1 Raptors

- To avoid potential disturbance to breeding Schedule 1 listed raptors, all areas within 300m of construction activities within the Proposed Development would be surveyed in advance of works being commenced during the core breeding season (1st March to 31st August, inclusive) to identify any nesting locations for such species.
 - Where necessary, work exclusion buffers around identified nest sites would be established in accordance with current NatureScot guidance (Goodship and Furness, 2022) or best available species guidance applicable at the time and/ or as agreed in consultation with NPTCBC and NRW. No works would be permitted within the implemented exclusion zone until where otherwise advised by the ECoW.
- 10.5.15 Compliance reporting for all works undertaken under the CBBPP would be provided to NPTCBC and NRW on request and following the completion of construction works.

Habitat Management Plan

- 10.5.16 A Habitat Management Plan (HMP) for the Proposed Development will be finalised and implemented in consultation with NRW and NTPCBC, on the basis of the Outline Habitat Management Plan (OHMP) presented as Appendix 9.4 and in accordance with obligations under the Environment (Wales) Act 2016.
- 10.5.17 The objectives of the HMP as set out within the OHMP will seek to improve habitat interests on Site, and within the Tyle'r Waun SINC and Cwm Blaenpelenna SINC located on, and adjacent to, the Site (see Figure 9.7).
- 10.5.18 The Tyle'r Waun SINC is selected for blanket bog, with habitats comprising modified blanket bog, marshy grassland, valley mire and acid grassland and is noted to support adder and common lizard. Baseline surveys in 2019 and 2021 found that approximately half of the SINC is semi-improved grassland (see Appendix 9.1 and Figure 9.3), suggesting that habitats within may be drying out, and potentially transitioning from bog/marsh to grassland. Bog restoration measures to improve hydrological functioning within the SINC are therefore proposed, and which will serve to benefit wildlife such as reptiles and ground-nesting birds (like waders).
- 10.5.19 The Cwm Blaenpelenna SINC is located along the Nant Blaenpelenna watercourse and is selected for open mosaic on previously developed land, mosaic habitats and invertebrates (including butterfly assemblage). A management recommendation for the SINC is scrub/tree clearance to maintain open habitats and the mosaic character of the site. Sensitive scrub/tree clearance is proposed within the SINC. An OHMP setting out the broad principles is provided in Appendix 9.4.

10.6 Potential Effects

Receptors Scoped In and Scoped Out

- 10.6.1 Red kite was the only ornithology receptor scoped into detailed assessment and is assessed as being of medium value/sensitivity.
- 10.6.2 Red kite is listed on Annex 1 of the Birds Directive, Schedule 1 and Schedule 1A (which protects the species from intentional/reckless disturbance at all times) of the Wildlife and Countryside Act 1981 (as amended) and listed in Annex 1 of NatureScot guidance (2017).
- 10.6.3 Numbers of red kite continue to increase in Wales and the UK, with the species now on the BoCC Green list with increasing population numbers and distribution (Stanbury *et al.*, 2021). The most recent red kite population estimate for Wales is 1,350 pairs (Hughes *et al.*, 2021), with numbers of kite increasing in Wales by 413% since 1995 (Harris *et al.*, 2020), and Wales now supporting 30% of the British population (Hughes *et al.*, 2021). Subsequently, it is clear that the red kite population is in a sustained period of growth.
- 10.6.4 Although it is understood that there is no formal regional estimate for red kite, the species was described as becoming more frequent and breeding in West Glamorgan (where the Proposed Development is located), with birds reported from a total of 47 (breeding) locations in 2011 (Grenfell, 2012). Note, this estimate is over a decade old so is likely to underestimate the true red kite population now supported in West Glamorgan. It is highly likely that the West Glamorgan and regional population of red kites is also growing in line with national populations; the lack of current monitoring is considered likely to reflect reduced effort given that the species is now relatively common.

- 10.6.5 Red kite flight activity recorded during baseline VP Flight Activity Surveys between March 2019 and February 2020, and March 2021 and February 2022 comprised a total of 68 flights. This included 42 flights considered to be "at collision risk".
- 10.6.6 A single red kite nest site was recorded within proximity to the Proposed Development in 2019, but which was not active in 2021.
- 10.6.7 In the absence of regional-specific estimates and adopting a precautionary approach, if 47 (breeding) locations from Grenfell (2012) is considered as 47 red kite breeding territories, the one breeding territory recorded within the Study Area in 2019 may represent 2.13% of the West Glamorgan population.
- 10.6.8 The following ornithology receptors have been scoped out of detailed assessment:
- Nightjar;
 - Peregrine;
 - Harrier species (hen and marsh);
 - Merlin;
 - Goshawk;
 - All other commoner raptors (including kestrel);
 - Short-eared owl;
 - All gulls;
 - All passerines; and
 - Raven.
- 10.6.9 Those species which are scoped out of detailed assessment are considered to be low value/sensitivity, generally comprising common and widespread species (with some not considered sensitive to wind farm developments (NatureScot, 2018b) and/ or were recorded very infrequently or in numbers of very low importance during the baseline studies, in that the potential for effects from the Proposed Development on the species is considered inconsequential and not significant at any population level.
- 10.6.10 A detailed assessment of potential effects on nightjar from the Proposed Development is scoped out, given the spatial separation between the Proposed Development's turbines and recorded locations of churring males associated with forestry and clear-fell habitats outside of the Site (>250m from all turbines, with the exception of one turbine, which is approximately 170m). The distance is greater than the recommended lower buffer zone limit for nightjar during the breeding season (150m to 500m in Goodship and Furness, 2022). There is also evidence from operational monitoring for the adjacent Pen y Cymoedd Wind Farm that nightjar will breed within 60m of operational turbines, and with no evidence for displacement effects (BSG Ecology, 2017). Finally, the location of churring males seldomly corresponds to the nest site, and it is unclear the extent to which churring males are representative of actual breeding territory locations (see BSG Ecology, 2017). Forestry planting in the MB area has potential to attract nightjar into the Site, and thus closer to turbines. However, given the lack of displacement effects of wind turbines (as evidenced above) effects are not anticipated.
- 10.6.11 Effects on the three designated sites with ornithological interest within 10km of the Site (Crymlyn Burrows SSSI, Mynydd Ty-Isaf SSSI and Crymlyn Bog Ramsar and SSSI) are scoped out of detailed assessment owing to the considerable spatial separation between the

Site and these designated sites (8.3km to 9.5km) and absence of pathways for significant effects, compared to the (likely) core range for the qualifying species (see NatureScot, 2016a); and, for Crymlyn Bog Ramsar and SSSI qualifying species (reed and sedge warbler) which are not considered sensitive to wind farm developments (see NatureScot, 2017).

- 10.6.12 The following assessment therefore only assess in detail the potential for significant effects upon red kite, both as a result of the Proposed Development alone, and cumulatively in-combination with other wind farm developments in the absence of additional mitigation.

Construction Phase

- 10.6.13 Potential construction phase ornithological effects associated with the Proposed Development are considered to relate to disturbance/ displacement of birds from the area occupied by the Proposed Development and surrounding areas as a result of the construction of the Proposed Development.
- 10.6.14 Potential effects are assessed on the assumption that embedded mitigation measures, as detailed in section 10.5 and within Chapter 2: Site Description and Chapter 4: Proposed Scheme Description, Alternatives, Design are implemented.
- 10.6.15 During construction of the Proposed Development, noise and visual disturbance could lead to the temporary displacement or disruption of breeding and foraging birds. The magnitude of effect would be dependent on the timing, the extent of displacement, species affected and availability of alternative suitable habitats within the Site's locality.

Red Kite

- 10.6.16 Baseline surveys recorded a single red kite breeding territory within the Study Area, with an active nest recorded in 2019 (but not in 2021). Red kite activity recorded during VP flight activity comprised a total of 68 flights across the 2-year survey period.
- 10.6.17 With the exception of one turbine, the location of the Proposed Development's turbines are >300m from the red kite nest site identified in 2019, and therefore beyond the maximum suggested disturbance buffer zones for the species thus minimising the potential for disturbance (disturbance buffer zone of 150-300m suggested in Goodship and Furness, 2022).
- 10.6.18 One turbine is however located within the maximum suggested disturbance buffer zone with the potential for disturbance to occur during construction works, should breeding pairs chose to utilise the nest site during the construction period.
- 10.6.19 As determined during baseline surveys, the nest sites chosen by red kite can be variable between years with the on-site nest site used in 2019 but not in 2021.
- 10.6.20 Depending on the location of future nest sites within proximity to construction working areas, some level of disturbance may be caused to breeding birds and foraging birds and which may result in lowered productivity in the short-term. It is considered unlikely that this red kite breeding territory would be lost, but rather the pair would relocate to another available nesting tree/woodland away from disturbing activities, on, or adjacent to, the Site.
- 10.6.21 However, taking a precautionary worst-case scenario approach that the construction works for the Proposed Development could displace the red kite pair from the Study Area due to proximity of working areas to the nest site, this would represent 2.13% of the regional

population estimate (for West Glamorgan; based on 47 breeding locations/ territories as stated in Grenfell, 2012). It is highly likely that the population has increased substantially since 2011, and in line with national (Wales and UK) populations.). Subsequently, the worst-case scenario based on 2011 population levels is considered to be a substantial over-estimation.

- 10.6.22 Overall construction phase disturbance/displacement to red kite is considered to represent no more than a Short-term, **Low magnitude** effect at the regional population level, which is of **Minor Adverse** significance and **Non-Significant** in the context of the EIA Regulations. This is with consideration also given to mitigation adopted for Schedule 1 species to enable legislative compliance summarised in section 10.5.

Operational Phase

- 10.6.23 Potential operational ornithological effects associated with the Proposed Development are considered to relate to collision mortality risks and disturbance/ displacement of birds from the area occupied by the Proposed Development and surrounding areas as a result of the operation of the Proposed Development.
- 10.6.24 It is considered that if the effect is likely to be displacement of breeding red kite by the Proposed Development, the collision risk estimate is likely to be lower than stated, given fewer red kite flights would be expected associated with the Site. The effects stated in this chapter are therefore considered likely to represent worst-case scenarios.
- 10.6.25 Collision risk analysis has been undertaken for red kite, on the basis of the low incidence of "at collision risk" flight activity recorded for all other target species. Full details are provided in Appendix 10.2.

Red Kite

Displacement

- 10.6.26 There is limited evidence for displacement effects upon red kites as a result of operational wind farms, with kites often reported foraging close to wind farm sites (e.g., Hötter *et al.*, 2017), and a review by Madders and Whitfield (2006) reporting sensitivity of the species to displacement by wind farms as being low. A long-term study of potential effects (including displacement) upon red kite at the Braes of Doune Wind Farm near Stirling in central Scotland, found that kites continue to use the area and frequently passed through the operational wind farm (Duffy and Urquhart, 2014).
- 10.6.27 The habitat within 290m of the Proposed Development's turbine locations is typically open grassland habitat with some trees and forest plantation, which will provide suitable nesting and foraging habitat for red kite. Furthermore, the MFD area of the Site is largely used for livestock (sheep) grazing and thus there is potential for a food resource onsite (carrion). The nest site is however not enclosed by Proposed Development's turbines with all turbines to the north, north-east and east, and thus barrier effects to birds accessing and egressing the nest site (if in use) are considered unlikely.
- 10.6.28 Overall red kite flight activity within 290m of Proposed Development's turbine across the 2-year survey period was 68 flights, with 42 of these identified as "at collision risk".
- 10.6.29 For the purposes of a precautionary assessment, the Proposed Development may affect the potential foraging range for one known breeding pair of red kites, and/or result in reduced breeding success or subsequent abandonment of the territory by the pair. Displacement of

the red kite pair from the Study Area as a result of the operational Proposed Development would represent 2.13% of the regional population estimate (for West Glamorgan; based on an outdated 47 breeding locations/ territories as stated in Grenfell, 2012, and which has likely to have substantially increased in the interim period). The consented forestry planting in the MB area is also likely to affect foraging opportunities for red kite by reducing the areas of open habitat.

- 10.6.30 Overall, operational phase disturbance/displacement to red kite is considered to represent no more than a Long-term, **Low magnitude** effect at the regional population level, which is of **Minor Adverse** significance and **Non-Significant** in the context of the EIA Regulations.

Collision Mortality

- 10.6.31 Incidents of red kite collision fatalities at operational wind farms in the UK are uncommon, but not unprecedented (e.g., Braes of Doune Wind Farm). Despite the potential for collisions, red kite populations are demonstrated to continue to increase in key areas with an increasing number of operational and proposed wind farm development (Sansom *et al.*, 2016).
- 10.6.32 Collision mortality risks to red kite have been estimated using the NatureScot CRM (Band *et al.*, 2007) using flight activity data for the period March 2019 to February 2020 (Year 1), and March 2021 to February 2022 (Year 2), with a total of 42 "at collision risk" flights identified.
- 10.6.33 The NatureScot CRM estimates an annual collision mortality risk of 0.323 red kites (based on Year 2 survey results) for the Proposed Development, or one bird death every 3.10 years, with an avoidance rate of 99%, in accordance with guidance (NatureScot, 2018c; see Urquhart and Whitfield, 2016).
- 10.6.34 Estimated annual collision mortality risks of 0.323 birds represents 0.34% of the most recent documented regional Glamorgan red kite population (47 pairs; assumed 94 birds; taken from Grenfell, 2012); which is considered precautionary on account of national population growth of red kite.
- 10.6.35 Estimated adult survival rates for red kite are stated as 61% (Saether, 1989), which gives a baseline mortality of 39% for adult birds. Assuming a regional population estimate of 47 pairs (94 adult birds), the baseline mortality rate in the absence of the Proposed Development would be 37 adult birds (adopting a highly precautionary approach where all fatalities were assumed to be adults). The additional estimated annual mortality (0.323 birds) resulting from the Proposed Development represents a 0.87% increase in annual baseline regional mortality. This value is considered likely to overestimate the potential effects of the Proposed Development on baseline mortality given population growth since 2011, that wind farms have not been identified as a factor which is hindering red kite population growth (see Sansom *et al.* 2016), and because there is strong evidence that red kites exhibit high levels of avoidance to collisions with wind turbines, despite continued use of wind farm sites (Whitfield and Madders, 2006).
- 10.6.36 Overall collision mortality risks to red kite are considered to represent no more than a Long-term, **Low magnitude** effect at the regional population level, which is of **Minor Adverse** significance and **Non-Significant** in the context of the EIA Regulations.

Decommissioning Phase

- 10.6.37 Potential decommissioning effects are considered to be similar to those identified for the construction phase (i.e., disturbance/displacement). Decommissioning effects are therefore not considered separately for each ornithological receptor.
- 10.6.38 The future of the bird community at the time of decommissioning (35 years) is unknown and cannot be reasonably assumed with any certainty.
- 10.6.39 In the absence of mitigation, decommissioning effects may result in the destruction of nest sites and disturbance and displacement of medium sensitivity species such as red kite.
- 10.6.40 Providing the implementation of good practice measures such as those summarised in section 10.5 and included in the outline Construction Environmental Management Plan (CEMP) (Appendix 4.1, be included, it is unlikely that significant effects upon important ornithological receptors would occur during the decommissioning phase.

10.7 Additional Mitigation

- 10.7.1 There are no significant adverse effects predicted for any important ornithological receptor as a result of the construction, operation or decommissioning of the Proposed Development, either alone or cumulatively with other developments (for cumulative assessment, see section 10.10). As such no additional mitigation is required in accordance with CIEEM guidance (2018).

10.8 Residual effects

- 10.8.1 No significant residual effects are predicted to occur upon red kite or any other important ornithological receptor as a result of the construction, operation or decommissioning of the Proposed Development, either alone or cumulatively with other developments (see section 10.10) via 'in-combination' effects or 'effect interactions'.
- 10.8.2 As such, residual effects for all important ornithological receptors are **Non-significant**. The Proposed Development will not have unacceptable adverse effects and HMP measures will deliver biodiversity net gain in accordance with the Environment (Wales) Act 2016, and as request by PEDW (see table 10.1).

10.9 Implications of Climate Change

- 10.9.1 The UKCP18 climate change projections, most notably predict increased summer and winter temperatures and higher average precipitation rates in summer and winter (Appendix 3.3). These factors are likely to result in an extended breeding bird season with earlier in the year (and likely more) nesting attempts (which has potential to increase breeding productivity, although this will be dependent on prey availability), but contrary to this the increased rainfall is likely to result in higher rates of fledgling mortality.
- 10.9.2 The opposing potential effects of climatic change on ornithology receptors makes predicting future likely outcomes difficult. There is no reason to consider that the breeding bird assemblage presenting using the Site will change substantially over the lifespan of the Proposed Development due to climate change. However, breeding productivity, given the predicted substantially higher rates of average precipitation across the lifespan of the Proposed Development (according to the UKCP18 climate change projections) is considered likely to reduce, and this may have notable effects for species recorded, such as red kite, which have one brood per year.

- 10.9.3 Potential effects on ornithology receptors detailed in this chapter are not predicted to substantively change in relation to climate change over the lifespan of the Proposed Development.

10.10 Cumulative effects

Potential Cumulative Construction Effects

- 10.10.1 Construction activities at nearby projects could result in cumulative disturbance and displacement effects when within close proximity to the Site if undertaken at the same time or consecutively.
- 10.10.2 Those consented (or in planning) wind farm developments (shown in Figure 7.9) within 5km of the Site are considered for the potential to contribute to cumulative construction effects. Operational developments are omitted from consideration in the cumulative construction effects given these developments will not contribute to cumulative construction phase effects.
- 10.10.3 Accordingly, the potential for cumulative effects on ornithology receptors (red kite given this was the only receptor subject to detailed assessment) to occur is only considered in relation to amendment in tip height application for the operational Melin Court Wind Farm (Planning Ref: P2014/0883) which was approved in May 2018.
- 10.10.4 The effect of habitat loss and disturbance/displacement on foraging red kite was considered to be negligible for Melin Court Wind Farm, in the context of the small area of suitable foraging habitat to be lost and the low level of kite activity during ornithology surveys. As such, a detailed cumulative assessment of potential impacts at the regional population scale is not considered necessary.
- 10.10.5 Construction impacts of the Melin Court Wind Farm were deemed to be short-term, negligible adverse and Non-Significant. The cumulative assessment presented for the development (Chapter 7) also concluded a highly unlikely of cumulative construction effects.
- 10.10.6 Notwithstanding, a high-level assessment can be undertaken on the assumption that for any development to proceed it will be required to comply with legislation and planning policy and a full assessment of effects and subsequent mitigation or compensation will be required, as necessary.
- 10.10.7 The cumulative construction effects of the Proposed Development in-combination with this other project (should the two developments be constructed simultaneously) are predicted to be Short-term, **Minor Adverse** and **Non-Significant** in the context of the EIA Regulations.

Potential Cumulative Operational Effects

- 10.10.8 A review of publicly available documentation for those wind farms (and other notable developments) out to 10km (see Figure 3.1) for red kite (scoped into detailed assessment), found no evidence of significant displacement effects upon red kite. The potential for loss and/or, reduction in available foraging opportunities for the species is therefore considered negligible, in the context of the available opportunities locally and the wider regional (Glamorgan) spatial scale.

- 10.10.9 Potential cumulative effects as a result of operational displacement to red kite are therefore not considered likely at any population scale, and Non-Significant in the context of the EIA Regulations.
- 10.10.10 Only cumulative operational collision risks for important ornithological receptors (red kite) have been considered as being potentially significant for the purposes of this assessment.
- 10.10.11 The geographic scale at which a cumulative assessment of collision risks for red kite has been undertaken is 10km, which is above the maximum documented foraging distance for the species (6km; in accordance with NatureScot, 2016a), and thus 10km is considered precautionary and a worst-case scenario for the identification of potentially significant cumulative regional effects.
- 10.10.12 A summary of predicted cumulative annual collision mortality risks to red kite, including the Proposed Development and other wind farm developments (for which data was available), is provided in Table 10.5. All considered wind farm developments, within 10km of the Site, shown in Figures 3.1 & 7.9 are considered in the assessment (excluding those micro-schemes as detailed in section 10.3).
- 10.10.13 Where the wind farm is not included in Table 10.5, information required to inform a cumulative assessment is not publicly available or has not been presented. For the purposes of the assessment in these instances, no collision risk is therefore considered. Those wind farm developments which are listed with a '0' estimate in Table 10.5, did have publicly available information, but no collision risk for red kite was reported (and thus collision risk estimates for red kite are considered inconsequential).
- 10.10.14 Estimates presented for other wind farm developments in Table 10.5 have not been checked or amended to reflect avoidance rates used within this assessment.

Table 10.5 Cumulative Collision Risk for Red Kite

Wind Farm	Annual Collision Risk Estimate
The Proposed Development	0.323
Pen y Cymoedd (Planning Ref: P2009/1053)	0
Mynydd Brombil (Planning Ref: P2012/0638)	0
Melin Court (Planning Ref: P2014/0883)	0.02 (per breeding season)
Maesgwyn (Planning Ref: P2014/0733)	0
Fynnon Oer (Planning Ref: P2002/1322)	0
Foel Trawsant (Planning Ref: P2014/0825)	0.666
Lynfi Afan (Mynydd Y Gelli) (Planning Ref: P2010/1148)	0.055
Upper Ogmere (Planning Ref: P2020/1002)	0.13585
Total	1.20

- 10.10.15 The cumulative regional collision mortality risk estimates for red kite can be calculated at 1.2 birds per year, which represents 1.28% of the most recent breeding regional population estimate for West Glamorgan (94 adults), and a 3.24% increase in annual regional baseline mortality. The estimate is considered an over-estimation in the context of the expanding red kite populations and likely outdated West Glamorgan estimate (from Grenfell, 2012).
- 10.10.16 Overall cumulative collision mortality risks to red kite are therefore considered to represent no more than a Long-term, **Low magnitude** effect at the regional population level, resulting in a **Minor Adverse** cumulative effect which is **Non-Significant** in the context of the EIA Regulations.
- 10.10.17 This estimate is considered likely to overestimate the potential effects of the Proposed Development on baseline mortality given wind farms have not been reported as hindering red kite population growth (see Sansom *et al.* 2016), and because there is strong evidence that red kites exhibit a high level of avoidance to collisions with wind turbines, despite continued use of wind farm sites (Whitfield and Madders, 2006).

10.11 Grid Connection

- 10.11.1 The indicative grid connection route corridor for the Proposed Development is shown on Figure 4.14. This assessment of the grid connection is based on a mix of overhead line and underground cabling which is predominantly close to/along existing tracks and road network, and through open grassland habitats (likely used for livestock grazing) which is considered likely to be of low value for important ornithology receptors. The installation would not result in any permanent habitat loss, given there will be appropriate reinstatement of habitats, with temporary losses considered minimal. The works to the grid connection will avoid those more valuable habitats for ornithology (woodland and hedgerows) and will avoid (or minimise) temporary effects on SINC's along the route. The construction would be of limited duration but would, however, give rise to temporary habitat loss and disturbance to birds particularly passerines and some numbers of ground-nesting species, that may inhabit suitable breeding habitats along the route corridor and adjacent areas.
- 10.11.2 Works associated with the grid connection would adhere to those good practice measures detailed in section 10.5 within a CEMP and which will enable legislative compliance with regards to breeding birds.
- 10.11.3 Although the grid connection could result in some small-scale temporary habitat loss and disturbance of birds, it is envisaged that the effects on ornithology, with good practice measures adopted, will be Short-term, **Negligible Adverse**, and **Non-Significant** in the context of the EIA Regulations.

10.12 Summary

- 10.12.1 A summary of potential effects upon ornithological receptors subject to detailed assessment is set out in Table 10.6.

Table 10.6 Summary of effects

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Construction Phase					
Red Kite	Displacement/ Disturbance	Minor adverse, Non-significant	Not required. Good practice protocols included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Minor adverse	Non-significant
Operation Phase					
Red Kite	Displacement/ Disturbance	Minor adverse, Non-significant	Not required.	Minor adverse	Non-significant
Red Kite	Collision Mortality	Minor adverse, Non-significant	Not required.	Minor adverse	Non-significant
Decommissioning Phase					
Red Kite	Displacement/ Disturbance	Minor adverse, Non-significant	Not required. Good practice protocols included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP (extended to decommissioning period).	Minor adverse	Non-significant

10.13 References

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11 Geology, Hydrology, Hydrogeology and Peat

11.1 Introduction

11.1.1 This Chapter assess the potential significant effects of the proposed development on geology, hydrology and hydrogeology and peat (primarily with regard to the water environment). It has been prepared by SLR Consulting and has been developed under the direction of a Technical Director of Hydrology at SLR who specialises in Hydrological Assessment, Flood Risk and associated planning matters.

11.1.2 Readers are also referred to a Flood Consequence Assessment (FCA) that has been prepared and is submitted as part of this planning application and should be read in conjunction with this chapter (see Technical Appendix 11.1). A Soil and Peat Management Plan and Mining Risk Assessment has also been prepared as part of the application and should also be read in conjunction with this chapter (see Technical Appendices 11.2 and 11.3). An outline Construction Environmental Management Plan (CEMP) is included as Technical Appendix 4.1.

Study Area

11.1.3 The study area is shown on Figure 11-1 and includes the site boundary. Off-site areas with potential hydrological connection to the site have also been taken into consideration up to a distance of 2 km from the site boundary.

Approach

11.1.4 This assessment has involved the following approach:

- Completion of a detailed desk study to establish current baseline geological, hydrogeological and hydrological conditions;
- Validation of a desk study by a site walkover survey and ground investigations undertaken across 19/04/2022-21/04/2022, 01/08/2022-02/08/2022 and 12/09/2022, involving peat probing;
- Identification of possible measures to avoid and mitigate against any adverse changes (impacts) resulting from the proposed development; and
- Evaluation of the residual significance of these impacts by consideration of the sensitivity of the baseline feature of the site and potential magnitude of changes, following mitigation.

11.1.5 The desk study was undertaken in order to:

- Determine geological, hydrogeological and hydrological conditions within and adjacent to the proposed development; and
- Identify sensitive water dependent receptors which may potentially be impacted by the proposed development.

11.2 Policy Context

11.2.1 The following key legislation and policy context has been taken into consideration:

- The Groundwater Directive (2006/118/EC), Water Framework Directive (2000/60/EC) and Floods Directive (2007/60/EC);
- The Groundwater (England and Wales) Regulations 2009 implements in England and Wales Article 6 of the GWD which details measures to prevent or limit inputs of pollutants into groundwater;
- The Flood Risk Regulations 2009 transposes the EU Floods Directive into UK legislation and sets out requirements of the Environment Agency (EA), NRW and local authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales;
- The Environmental Permitting (England and Wales) Regulations (2016) (EPR), which includes controls to protect groundwater quality by preventing inputs of Hazardous Substances and limited pollution from Non-Hazardous Pollutants under the Water Framework Directive;
- The Water Resources Act 1991 and amendment (England and Wales) Regulations 2009. The Act regulates water resources, water quality and flood defence. The amended Regulations make changes to the powers for carrying out anti-pollution works and serving notices;
- Land Drainage Act 1991 and 1994 sets out requirements for maintenance of watercourses by riparian owners;
- Flood and Water Management Act (2010), which introduces powers for local authorities to manage flood risk;
- Environment Act, 1995 sets out roles and responsibilities for NRW;
- The Private Water Supplies (Wales) Regulations 2017 transpose requirements of European Law on the quality of water intended for human consumption from private abstractions;
- Water Supply (Water Quality) Regulations (Wales) 2018.
- Future Wales: The National Plan 2040 (2021), Welsh Government:
- Policy 8 - Flooding
Promotes nature based solutions to flood risk management and states that projects do not have adverse impacts on designated sites;
- Policy 9 - Resilient Ecological Networks and Green Infrastructure
Includes for identification of areas which should be safeguarded and created as ecological networks for their importance for adaptation to climate change, for habitat protection, restoration or creation, to protect species, or which provide key ecosystems services, to ensure they are not unduly compromised by future development;
- Policy 17 - Renewable and Low Carbon Energy and Associated Infrastructure
States that all proposals should demonstrate that they will not have an unacceptable adverse impact on the environment;
- Policy 18 - Renewable and Low Carbon Energy Developments of National Significance
Criteria 11 requires 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.
- Planning Policy Wales (PPW), Edition 11 (2021), Welsh Government:
- Technical Advice Note (TAN) 15 - Development and Flood Risk (2004), Welsh Government
- At the time of reporting, the outcome of consultation on a revised version of TAN15 was awaited. This emerging guidance will be taken into consideration as part of the assessment prior to its formal release;

- Ecosystem resilience and reversing decline in biodiversity (paragraph 6.4.3)
Developments must consider the need to safeguard existing habitat and biodiversity assets from impacts which directly affect compromise the resilience of ecological networks and the components which underpin them, such as water and soil, including peat.
- Natural Resources Policy (2017), Welsh Government;
- Neath Port Talbot County Borough Council (NPTCBC) Local Flood Risk Management Strategy (2013); and
- NPTCBC Local Development Plan (2011 – 2026):
- Strategic Flood Consequences Assessment Stage 1 & 2 (September 2014);
- Policy SP1 - Climate Change
The likely increased flood risk due to climate change will be taken into account and addressed by ensuring that there is greater resilience by avoiding development on land that is at risk from flooding in the first instance in accordance with the sequential approach set out in PPW TAN15 or in locations that could increase the risk of flooding elsewhere;
- Policy EN8 – Pollution and Land Stability
All development will be expected to minimise any adverse effect on water quality, including exacerbation of existing poor water quality or direct pollution from the proposed development. Developments will be required to ensure that no pollution is caused through drainage;
- Policy BE1 - Design
Drainage systems should be designed to ensure that developments have no detrimental effects on the water environment or on flood risk.

Guidance

11.2.2 The assessment was undertaken with respect to relevant guidance including the following:

- Control of Water Pollution from Construction Sites (C532), Construction Industry Research and Information Association (CIRIA) 2001;
- Environmental Good Practice on Site (C741), CIRIA 2015;
- Control of Water Pollution from Linear Construction Projects: Site Guide (C649), CIRIA 2006;
- Control of Water Pollution from Linear Construction Projects (C648), CIRIA 2006;
- Natural Resources Wales (NRW's) Guidance for Pollution Protection – Works and maintenance in or near water, version 1.2, February 2018;
- The Sustainable Drainage System (SuDS) Manual (C753), CIRIA 2015;
- Guidance for Pollution Prevention (GPP) which will replace the Pollution Prevention Guidelines (PPG) adopted by NRW, Scottish Environment Protection Agency (SEPA) and the Northern Ireland Environment Agency:
- PPG01: General guide to the prevention of water pollution;
- GPP5: Works and maintenance in or near water;
- PPG06: Working at construction and demolition sites; and
- GPP21: Pollution incident response planning.
- Net Zero Strategic Plan¹ (2022), Welsh Government
Safeguarding and increasing carbon stores in soils and biomass.

¹ Available at <https://www.gov.wales/welsh-government-net-zero-strategic-plan> [Accessed May 2023]

Sources of Information

11.2.3 The following sources of information have been consulted in order to characterise the geology, hydrology and hydrogeology of the area within and surrounding the proposed development:

- Lle Geo-Portal, Welsh Government and NRW²;
- Flood Zone and Development Advice Map data relating to flood risk^{3 4};
- Spatial Flood Defence data and mapping;
- Flood Warning and Flood Alert Areas; and
- Main Rivers.
- Historic and active landfill sites⁵;
- Water Framework Directive (WFD) surface water and groundwater classification data⁶;
- British Geological Survey (BGS) GeoIndex mapping⁷;
- Geology – artificial ground, mining, superficial deposits, bedrock;
- Borehole data; and
- Aquifer designation and groundwater vulnerability.
- Department for Environment, Food and Rural Affairs (DEFRA) MAGIC website⁸;
- Groundwater Source Protection Zones (SPZ);
- Statutory and non-statutory environmental designations;
- Centre of Ecology and Hydrology (CEH Wallingford) National River Flow Archive⁹;
- Cranfield Soil and Agrifood Institute Soilscape map viewer¹⁰ - Soil type and character;
- NRW National Peatland Action Programme portal viewer¹¹ - peatlands of Wales;
- Details of private abstractions and discharges from NPTCBC; and
- Details of the proposed development provided by Naturalis Energy Developments.

² Available at <https://naturalresourceswales.gov.uk/?lang=en> [Accessed May 2023]

³ Available at https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=2 [Accessed May 2023]

⁴ Available at <https://flood-map-for-planning.naturalresources.wales/> [Accessed May 2023]

⁵ Available at <https://naturalresourceswales.gov.uk/evidence-and-data/maps/find-details-of-permitted-waste-sites/?lang=en> [Accessed May 2023]

⁶ Available at <https://datamap.gov.wales/> [Accessed May 2023]

⁷ Available at <http://mapapps2.bgs.ac.uk/geoindex/home.html> [Accessed May 2023]

⁸ Available at <https://magic.defra.gov.uk/> [Accessed May 2023]

⁹ Available at <https://nrfa.ceh.ac.uk/data/search> [Accessed 22 September 2022]

¹⁰ Available at <http://www.landis.org.uk/soilscape/> [Accessed May 2023]

¹¹ Available at <https://smnr-nrw.hub.arcgis.com/apps/d18ef8c74ecc4dc4a0cbf71ab6935ba0/explore> [Accessed May 2023]

11.3 Assessment Methodology

Predicting Effects

- 11.3.1 There are no published guidelines or criteria for assessing and evaluating effects on geology, hydrology, hydrogeology or peat within the context of an EIA. The assessment has therefore been based on a methodology derived from the Institute of Environmental Management and Assessment (IEMA) guidance¹². The methodology sets out a list of criteria for evaluating the environmental effects as detailed below.
- 11.3.2 A qualitative risk assessment methodology has been used to assess the significance of the potential effects associated with the proposed development. Two factors have been considered using this approach: the sensitivity of the receiving environment and the magnitude of potential change, should that potential change occur.
- 11.3.3 This approach provides a mechanism for identifying the areas where site specific mitigation measures are required, appropriate to the risk presented by the scheme. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.
- 11.3.4 As an impact assessment, this chapter does not explicitly consider the risk of flooding to the proposed development but does consider how the proposals may alter flood risk at the site and elsewhere. The flood risk to the proposed development is considered separately in the Flood Consequence Assessment (Technical Appendix 11.1).
- 11.3.5 This impact assessment does assess potential changes to the site arising from climate change projections, with particular regards to changes to peak rainfall intensity and fluvial flows due to their applicability at the site.

Assessment Criteria and Assignment of Significance

- 11.3.6 The approach for determining the significance of effects is a two stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts on those receptors. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. Unless stated otherwise the terms used to define sensitivity and magnitude are based on those used in the Design Manual for Roads and Bridges (DMRB) methodology (DMRB 2009).
- 11.3.7 The criteria for sensitivity used in this chapter are outlined in Table 11.1 below. Whilst a sensitivity category of 'very high' is proposed as a potential category for sensitivity criteria within the DMRB methodology, for the purposes of the assessment of geology, hydrology, hydrogeology and peat effects, the categories within the range of 'high' to 'negligible' are considered to appropriately cover the potential receptors. Where a receptor could be placed within more than one category of value, professional judgement has been applied to determine which category is appropriate.

¹² IEMA (2004) Guidelines for Environmental Impact Assessment

Table 11.1 Value/sensitivity assessment

Receptor value / sensitivity	Receptor type
High	• receptor with high importance and rarity, international level, with no / negligible potential for substitution / replacement; • receptor is of international ecological importance (e.g. Ramsar site, water based Special Protection Area (SPA), or Special Area of Conservation (SAC)); • receptor is a watercourse or water body of good chemical status/ high ecological status and/ or high quality targets under the Water Framework Directive (2000/60/EC); • receptor is used for public water supply (including Drinking Water Protected Areas); and • receptor is at high risk from flooding above 3.3% Annual Exceedance Probability (AEP) and/or water body acts as an active floodplain or flood defence.
Medium	• receptor with medium importance and rarity, national or regional level, with limited potential for substitution; • receptor is of national ecological importance (e.g. water based National Nature Reserve or Site of Special Scientific Interest (SSSI); • receptor is a watercourse or water body of good chemical status/ moderate to good ecological status and/ or moderate to high quality targets under the Water Framework Directive; • receptor is used for private water supply; and • receptor is at moderate risk from flooding (3.3% AEP to 1% AEP) but does not act as an active floodplain or flood defence.
Low	• receptor with low importance and rarity, local or district level, with potential for substitution; • receptor is of local ecological importance (e.g. non-statutory water based County Wildlife sites); • receptor is a watercourse or water body with a chemical water quality status classed as of 'fail' or an ecological water quality status classed as 'poor' and/ or moderate quality targets under the Water Framework Directive; • Receptor is a watercourse or water body supporting abstractions of limited sensitivity; and • receptor is at low risk from flooding (less than 1% AEP).
Negligible	• receptor with a very low importance and rarity, local scale (e.g. non-statutory water based wildlife sites and areas of local importance for nature conservation; pond or surface water feature with no significant sensitivity to water based ecological or water supply function); • receptor is a watercourse or water body with a chemical water quality status classed as of 'fail' and an ecological water quality status classed as 'poor' and/ or moderate quality targets under the Water Framework Directive; • environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character; and • receptor is not affected by the proposed development (e.g. it is remote from the site or lies within a different and unconnected hydrological catchment or hydrogeological regime).

11.3.8 Magnitude of impact, based on the change that the proposed development would have upon the resource/receptor, is considered within the range of high, medium, low, negligible. Consideration is given to scale, duration of impact/effect (e.g. for construction, short-term for 1-2 years, medium-term for 3-5 years, long-term for 5 years and greater, and permanent, dependent upon project timeframes) and extent of proposed development with reference to the definitions in Table 11.2 below.

Table 11.2 Magnitude of impact

Magnitude	Description
High	Fundamental (long term or permanent) changes to the baseline hydrology, hydrogeology and water quality likely to cause exceedance of statutory objectives and/or breaches of legislation; severe damage to key characteristics, features or elements (adverse), such as: • wholesale changes to watercourse channel, route, hydrology or hydrodynamics; • changes to the site resulting in an increase in runoff with flood potential; • significant changes to erosion and sedimentation patterns; • major changes to the water chemistry or hydro-ecology; and • major changes to groundwater levels, flow regime and risk of groundwater flooding.
Medium	Material but non-fundamental and short to medium term changes to baseline hydrology, hydrogeology and water quality, not adversely affecting the overall integrity; partial loss of/damage to key characteristics, features or elements with/without exceedance of statutory objectives or with/without breaches of legislation (adverse), such as: • some fundamental changes to watercourses, hydrology or hydrodynamics. • changes to site resulting in an increase in runoff within system capacity; • moderate changes to erosion and sedimentation patterns; • moderate changes to the water chemistry of surface water and groundwater; and • moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	Detectable but non-material and transitory changes to the baseline hydrology, hydrogeology and water quality resulting in reversible or minor loss of, or alteration to key characteristics, features or elements (adverse), such as: • minor or slight changes to watercourses, hydrology or hydrodynamics; • changes to site resulting in slight increase in runoff well within the drainage system capacity; • minor changes to erosion and sedimentation patterns; • minor changes to the water chemistry of surface water and groundwater; and • minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Very minor or no perceptible changes to the baseline hydrology, hydrogeology and water quality, resulting in; impact of insufficient magnitude to affect the use/integrity (adverse), such as: • no alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns; • no alteration or very minor changes to either groundwater or surface water chemistry; and • no alteration or very minor changes to groundwater recharge or flow mechanisms.

11.3.9 The predicted level of effect on geology, hydrology, hydrogeology and peat is based upon the consideration of magnitude of impact and sensitivity of the resource/receptor to come to a professional judgement of how important this effect is, as defined in the matrix presented at Table 11.3.

Table 11.3 Level of effect

Receptor Sensitivity	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

11.3.10 The level of effect that is considered to be significant in terms of this chapter is from Moderate or greater. A level of effect below Moderate is classed as not significant.

11.3.11 A statement of residual effects, following consideration of any further specific mitigation measures where identified, is then given.

Consultation

11.3.12 The scope of the study has been determined through a combination of professional judgement, reference to the relevant guidance documents and consultation with stakeholders through a formal EIA scoping process and pre-application advice.

11.3.13 Discussions have been held with NPTCBC Countryside and Wildlife team and Lost Peatlands Project team regarding the proposed development and peat. These discussions were used to inform the design process with a view to minimising the development footprint on deeper areas of peat and soils.

11.3.14 At the time of reporting, the following pre-application and scoping responses relevant to the geology, hydrology, hydrogeology and peat environment have been received from consultees.

Table 11.4 Summary of consultation relating to hydrology, hydrogeology, geology and peat

Consultee	Issue	Summary of Consultation	Comment / Action
Planning and Environment Decisions Wales (PEDW)	Historic mines and mining risk	PEDW noted that assurance that this aspect will be considered in the ES whether as a chapter or as an Appendix. The ES should include a Coal Mining Risk Assessment, including risk of subsidence. Areas at risk should be avoided. Where different types of turbine foundations are required, the Applicant should consider that this may have an impact on other aspects (for example ecology, noise and traffic).	Mining Risk Assessment (Technical Appendix 11.3)

Consultee	Issue	Summary of Consultation	Comment / Action
		The ES should include a detailed description of construction methods and the worst-case scenarios considered as appropriate.	Paragraph 11.3.18 to 11.3.19, 11.5 and the outline CEMP (Technical Appendix 4.1)
PEDW	Aquifer	The potential for the proposed development to impact the underlain aquifers should be addressed in the ES, in particular the risk of pollution during construction. If grouting is required during construction, the significance of the effect should be assessed and mitigation measures proposed.	Assessed in Section 11.6
PEDW	Peat	It is noted that peat probing is proposed. Peat probing should be conducted taking into account all proposed infrastructures including the solar arrays and internal roads. Depending on the results of the initial probing based on a 100 m grid, a stage 2 survey may be required. The ES should demonstrate that the Proposed Development infrastructure (including internal roads) and construction areas (including borrow pits) are not located within areas where peat is found to be at a depth higher than 0.5 m. If this will not be possible, mitigation measures and a peat management plan should be included in the ES.	Soil and Peat Management Plan (Technical Appendix 11.2)
PEDW	GWDTEs (Groundwater Dependent Terrestrial Ecosystems)	The ES should include an indication of hydrological flows through the peat and whether Groundwater Dependent Terrestrial Ecosystems (GWDTEs) are present within the Site or its Zone of Influence (Zol). PEDW recommends that the hydrological assessment should clearly define the Zol of the Proposed Development and the ES should cross reference the ecological and hydrological assessments. The ES should clearly identify the degree of groundwater flow disruption and the relationship between the site hydrological regime and habitats depending on near-surface groundwater	Assessed in Section 11.6
PEDW	Groundwater Monitoring	PEDW notes NRW's potential requirement for groundwater monitoring during construction.	See Paragraph 11.7.2

Consultee	Issue	Summary of Consultation	Comment / Action
		PEDW encourages the Applicant to liaise with NRW regarding the need for groundwater monitoring following surveys and further site assessment.	
Neath Port Talbot County Borough Council (NPTCBC)	Coal mining	It is noted that the application site falls within areas where there is Historic coal mining with various spoil tips within or adjacent to the boundary. Any permanent structures could be affected by ground gas from old mine workings and spoil tips and be a human health risk to site workers. It is therefore recommend that a Preliminary Risk Assessment and desk study is carried out to assess these risks.	Mining Risk Assessment (Technical Appendix 11.3)
Natural Resources Wales (NRW)	Groundwater	Tunnels, pipelines, and piling can result in risks to groundwater and surface water from, for example, pollution / turbidity, risk of mobilising historic contamination and drilling through different aquifers creating preferential pathways. It should be ensured that any proposed works will not result in contamination or affect water resources. A CEMP should be undertaken and included within the ES. A monitoring/inspection strategy/ plan covering watercourses and discharges from treatment areas will need to form part of the ES.	Assessed in Section 11.6, paragraph 11.7.2 and the outline CEMP (Technical Appendix 4.1)
NPTCBC Lost Peatlands Project team	Peat	More detailed ground investigations will be required to fully characterise the peat. All the peat to be removed during construction is shown as being used to reinstate verges, with none used for restoration. Have concerns over the use of peat to restore track verges. In the excavated materials calculator more material is being used on site than excavated.	Assessment of peat included at Section 11.4

Assumption and Limitations

11.3.15 The assessment is based on publicly available data obtained from NRW, NPTCBC and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

11.3.16 The assessment is limited by a lack of detailed information on:

- Flow data for watercourses and drainage channels; and
- Water quality data for specific locations.

11.3.17 Overall a moderate to high level of certainty has been applied to the study. Where available, catchment data regarding water quality has been used to inform the assessment, with a hydrological site walkover and site investigations undertaken to confirm desktop findings. The information accessible in order to complete the assessment is considered sufficient to establish the baseline within the geology, hydrology, hydrogeology and peat study area, therefore, there are no data limitations that would affect the conclusions of this assessment.

11.3.18 The Parameters assessed have been selected as that having the potential to result in the greatest effect on an identified receptor or receptor group. This scenario has been selected from the details provided in the project scheme description and design evolution (Chapter 4). Effects of greater significance are not predicted to arise should any other development scenario to that assessed be taken forward in the final design scheme, within the assessed boundaries.

11.3.19 It is assumed as part of this assessment that any mitigation measures set out in this ES chapter, the Flood Consequence Assessment, Mining Risk Assessment, Carbon Emissions Assessment, CEMP and Soil and Peat Management Plan will be established at the site. These are essential mitigation which directly impact the outcome of this assessment.

11.4 Baseline conditions

Current Baseline

11.4.1 The geology, hydrology, hydrogeology and peat environment at the proposed development site and the surrounding area is considered in a number of sub-sections:

- hydrogeological setting: soils and geology; recharge mechanisms; aquifer characteristics, groundwater levels and flow; water resources and abstractions; groundwater quality; and
- hydrological setting: surface water features and water dependent habitat, surface water quality, flood risk and surface water management.

11.4.2 This information has been used to develop a conceptual site model to assess potential impacts associated with the proposed development. The model has also been used to determine appropriate mitigation measures.

11.4.3 A series of site-specific assessments relevant to this report have been undertaken and are as follows

- Flood Consequence Assessment, presented in Technical Appendix 11.1;
- Soil and Peat Management Plan, presented in Technical Appendix 11.2;
- Mining Risk Assessment, presented in Technical Appendix 11.3;

- Carbon Emissions Assessment, presented in Technical Appendix 11.4; and
- Construction Environmental Management Plan, presented in Technical Appendix 4.1.

Site Setting

- 11.4.4 The proposed development site lies approximately 7 km north east of Neath in South Wales and comprises of two main areas of the site, one on the boundary of Tonmawr to the north east (Mynydd Blaenafon (MB)), and the other on the opposite side of the Nant Blaenpelenna watercourse further to the north east (Mynydd Fforch Dwm (MFD)). The existing land uses at the site include pasture land, plantation and open country.
- 11.4.5 The grid connection corridor identified to the south west of the site initially follows a course to the north of the Afon Pelenna (Figure 4.14). Ground elevations along the corridor route gradually fall from the site to the potential substation connection at Baglan. Further detail for the route will be provided with a separate planning application.
- 11.4.6 Specific areas of the site which are referenced in this report are identified in Figure 11-1. This mapping also contains a 2 km buffer to the proposed development.
- 11.4.7 The application boundary corresponds to an area of around 290 ha. Around 50 ha of this comprises of the site access corridor, which would be provided for the construction and operation of the proposed development. The proposed access corridor uses a combination of existing and new access tracks which provide a route to and from the public highway.
- 11.4.8 Other local wind farm projects include Pen Y Cymoedd wind farm, which contains 76 turbines up to 145 m tip height), present to the north east of the design area and Ffynnon Oer wind farm, comprising 16 turbines with a 92 m tip height, also to the north east.
- 11.4.9 The topography locally is formed of steep river valleys with well incised channels. Within the eastern MFD area, ground levels range from around 200 m above Ordnance Datum (aOD) along the Nant Blaenpelenna watercourse in the north and west to 350 m aOD in the south east of the site.
- 11.4.10 Ground levels across the MB area to the west of MFD, vary from around 310 m aOD at the north eastern extent of the plateau, to 155 m aOD to the south of MB along the access corridor.

Designated Sites

- 11.4.11 The site is not located in or within 2 km of any designated sites. Earlswood Road Cutting and Ferryboat Inn Quarries Site of Special Scientific Interest (SSSI) is located around 8 km south west of the site between Port Talbot and Swansea, covering an area of approximately 6.9 ha. This is a geologically designated site due to its exposures of later carboniferous rocks and well-developed sedimentary structures.
- 11.4.12 Other designated sites in eastern Swansea include Crymlyn Burrows SSSI, 8.1 km south west of the site, which expands across an area of 241.5 ha comprising of sand dunes, salt marsh and woodland which has vast ecological and wildlife diversity. Crmlyn Bog is located around 10.5 km west of the site and is almost 300 ha in size. Crmlyn Bog is designated as an SSSI, SAC and National Nature Reserve (NNR) due to the nature of the land (bog / wetland) and vegetation types present.
- 11.4.13 Whilst Crmlyn Bog and Crmlyn Burrows may have some water dependency, surface water features locally are not part of the same surface water catchment area as the site, and

therefore any potential effects would not impact these SSSIs. Earlswood Road Cutting and Ferryboat Inn Quarries SSSI is purely a geological designation and therefore is not considered to be water dependent.

Hydrogeological Setting

Soils and Geology

Soils

11.4.14 Review of the Cranfield Institute Soils mapping indicates the site is underlain by a combination of soil types, including “Very acid loamy upland soils with a wet peaty surface”, “Slowly permeable wet very acid upland soils with a peaty surface” and “Freely draining acid loamy soils over rock” which is typically present on the valley slopes where peat has not formed.

11.4.15 The MB area of the site is underlain by the slowly permeable wet very acid upland soils with a peaty surface on the central and north western area of the plateau, while the south eastern extent of the plateau is underlain by the acid loamy upland soils with a wet peaty surface. On the slopes around the plateau, to the south and west, the site area is underlain by the freely draining acid loamy soils over rock into the Afon Pelenna and Gwenffrwd valleys.

11.4.16 The plateau in the MFD area of the site is generally underlain by the very acid loamy upland soils with a wet peaty surface, with the slowly permeable wet very acid upland soils with a peaty surface present in the eastern extent. On the slopes around the plateau, to the south and west, the site area is underlain by the freely draining acid loamy soils over rock into the valleys of Nant Cwm-y-Pant, Nant Fforch Dwm and Nant Blaenpelenna.

Peat Survey

11.4.17 Welsh Government data from the Peatlands of Wales¹³ mapping indicates that there are no peat deposits on the MB area of the site and peat on the MFD area is limited to the eastern extent of the site, coinciding with the location of Turbine T3 and two small isolated areas on the west of the MFD plateau, south of Turbine T6. As detailed in Chapter 9: Ecology, the habitat surveys identified areas of wet modified bog within the eastern extent of the MFD area of the site and areas of marshy grassland on the MB area plateau and in the east of the MFD area. The surveys consisted of an Extended Phase 1 Habitat Survey undertaken in 2019 (MFD area) and 2021 (MB area), to inform the development proposals. A peat depth survey was therefore undertaken in order to inform the design of the infrastructure layout, with development located away from areas with deep peat where achievable.

11.4.18 Phase 1 and Phase 2 peat probing surveys were undertaken in April 2022 and August 2022 respectively to establish the presence and extent of peat across the proposed survey area. Soil depths were measured to a maximum of 1.8 m based on probing and shallow soil samples were taken at a number of locations to confirm the presence or absence of peat and the degree of humification. The attributed depths from the probing survey are presented in Figure 11-3. Areas of deeper peat are typically found on the plateaus with depths generally of up to 1.0 m. In areas of steeper topography (Figure 11-2) the topsoil is present to up to 0.5 m

¹³ Available at <https://smnr-nrw.hub.arcgis.com/apps/d18ef8c74ecc4dc4a0cbf71ab6935ba0/explore>
[Accessed May 2023]

depth. Further details on the peat surveys undertaken are included within Appendix 11.2: Soil and Peat Management Plan.

- 11.4.19 The distribution of peat depths detailed in Figure 11.3 shows an area of deeper deposits towards the centre of the plateau within the MB area of the site. The maximum depth recorded during the Phase 1 survey was 1.5 m. Phase 2 surveys along the access track route and around Turbine T1 location identified further, more isolated, areas of deeper peat up to 1.0 m in depth. The design of the development was amended in these locations in order to move infrastructure onto shallower areas of peat. Samples of the soil on the MB plateau revealed moderately decomposed peat at shallow depth, with lighter colouration and a Von Post score between H3 and H5. On the survey points indicating a shallower depth, the samples of soil trended towards mineral soils below 0.3 m depth.
- 11.4.20 On the MFD area peat is generally restricted to the eastern extent of this part of the site. The maximum depth recorded during the Phase 1 survey was 1.8 m. All aspects of the proposed development apart from Turbine T3 are generally on areas where depth of probing was <0.45 m. Phase 2 peat probing was carried out to inform the positioning of turbine T3 which is now situated such that the turbine location and associated crane pad are on areas where peat depths are <0.5 m. Samples of the soil at the east of the MFD plateau revealed moderately decomposed peat at shallow depth, with brown colouration and a Von Post score between H3 and H6. Land to the east of the proposed development showed darker soils and some areas of more decomposed peat.
- 11.4.21 Peat landslide hazard risk has been assessed notwithstanding that the potential risk is deemed to be minimal due to the limited extent of peat proven along the alignment of the proposed development. The peat depth data (Figure 11-3) has been reviewed against the slope data (Figure 11-2) and observations of underlying substrate condition to complete an assessment of peat slide risk. All proposed development is situated in areas where peat depths are less than 1.0 m or on areas of no peat. A separate peat slide risk assessment is therefore not considered necessary. The proposed development is not considered to present a risk with regard to peat slide risk. Peat landslide hazard risk will be reviewed following more detailed ground investigations following consent being granted.
- 11.4.22 Due to the sensitivity and extent of peat on the site, soils are considered a high sensitivity receptor.

Superficial Geology

- 11.4.23 The superficial geology at the site, as defined by the BGS, is presented in Figure 11.4. This indicates that superficial deposits of glacial till / diamicton are present along the southern boundary of the site typically within the valley features. According to the mapping in Figure 11-4, some areas of peat are present in the east of the MFD area, however from intrusive investigation we know that isolated areas of peat and peaty soil are also present on the plateau at MB (see Figure 11-3). A very small lateral extent of glaciofluvial deposits, comprising sand and gravel, are present in the northern MFD area, at the base of the Nant Blaenpelenna valley.

Bedrock Geology

- 11.4.24 The bedrock geology of the site is identified in Figure 11-5. Bedrock geology is a combination of sandstone bedrock types, including the Hughes Member (Sandstone), which is present across the majority of the site and the Hughes Member (Mudstone Siltstone and Sandstone) which bounds the lateral extent of the Hughes Member (sandstone) on the site, Brithdir Member (Sandstone) present along the valley of Nant Blaenpelenna between MFD and MB

and across the south western part of the site as well as a very small lateral extent of the Brithdir Member (Mudstone, Siltstone and Sandstone), present in the very south of the site along Fforch-Dwm Road through Tonmawr.

Recharge Mechanisms

11.4.25 The standard average annual rainfall (SAAR) for the study area, as reported at river flow and rainfall gauging stations closest to the proposed development site are as follows:

- Flow Gauging Station 58002 on the River Neath (Neath at Resolven)¹⁴ located 3.9 km north west of the site:
- 1977 mm between 1941 and 1970
- 1946 mm between 1961 and 1990
- Rainfall Gauging Station at the site, Fforch Dwm¹⁵:
- 1565 mm for the 12 months between October 2021-September 2022

11.4.26 Across the site, infiltration rates are considered to be variable due to the presence of peat and peaty soils (low infiltration rates) and sandstone bedrock (higher infiltration rates). We would also expect variable infiltration into any glacial till / diamicton deposits due to the presence of clay (impermeable), but also potentially sandy deposits (permeable) that have been eroded from the bedrock.

Aquifer Characteristics, Groundwater Levels and Flow

Aquifer Characteristics

11.4.27 The aquifer characteristic for the strata on and in the immediate vicinity of the site are summarised below in Table 11.5 and illustrated in Figure 11-6.

Table 11.5 Aquifer Characteristics

Geological period	Formation	Description	Aquifer Characteristics
Superficial Geology			
	Glacial Till / Diamicton	Poorly sorted sediment suspended in an unconsolidated matrix of mud or sand. Locally, borehole records ¹⁶ indicate dense clayey sand and gravel with cobbles and rootlets.	Secondary (undifferentiated)
	Peat	Decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.	Unproductive
	Glaciofluvial Deposits	Mostly coarse-grained sediments (sands and gravels) with finer grained layers (clay and silt), recorded in boreholes locally ¹⁷ as	Secondary A

¹⁴ 58002 Neath at Resolven, National River Flow Archive, <https://nrfa.ceh.ac.uk/data/station/info/58002>

¹⁵ River Levels, Rainfall and Sea Data, Fforch Dwm Rain gauge, Natural Resources Wales, <https://rivers-and-seas.naturalresources.wales/Station/1089>

¹⁶ Available at <http://mapapps2.bgs.ac.uk/geoindex/home.html> [Accessed May 2023]

¹⁷ Available at <http://mapapps2.bgs.ac.uk/geoindex/home.html> [Accessed May 2023]

Geological period	Formation	Description	Aquifer Characteristics
		sandstone fragments in a clayey matrix and sandy clay.	
Bedrock			
Cretaceous	Hughes Member (Sandstone)	Pennant Sandstones and brown Sandstone with occasional shale beds over up to 270 m thick near Swansea.	Secondary A
	Hughes Member (Sandstone, Siltstone and Mudstone)	Green-grey, lithic arenites ("Pennant sandstones"), with thin mudstone/siltstone and thin coals up to 270 m thick at Swansea. The base is placed at the base of the Brithdir Coal where the coal rests on sandstones and thin mudstone/siltstones at the top of the Brithdir Member.	Secondary A
	Brithdir Member (Sandstone)	Green-grey, lithic arenites ("Pennant sandstones") up to 200 m thick in Swansea	Secondary A
	Brithdir Member (Mudstone, Siltstone and Sandstone)	Green-grey, lithic arenites ("Pennant sandstones") with conglomerate lenses at bases of units; thin mudstone/siltstone and seatearth interbeds and mainly thin coals up to 200 m thick in Swansea.	Secondary A

11.4.28 The bedrock types beneath the site (Hughes Member and Brithdir Member) are very similar in terms of geological description and lithological characteristics. Together the bedrock forms one larger aquifer and with likely horizontal and lateral flow (hydraulic conductivity) between the formations.

11.4.29 The Hughes Member and Brithdir Member are classified as Secondary A aquifers, defined as "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers."

11.4.30 Groundwater vulnerability is classified as Medium to High which is likely representative of the permeable sandstone strata which at lower depths could support higher volumes of groundwater with reasonable infiltration where the bedrock is present at the surface. However, the site is at a high elevation (over 250 m aOD) and it is unlikely that regional groundwater would be present at such elevations.

11.4.31 Shallow subsurface flows do occur on the site and often expel as springs from areas of falling topography. Known, permanent springs locally have been rerouted by the Coal Authority to mine water treatment plants locally (four on and around the site) for passive water treatment prior to discharge to surface waters.

11.4.32 The percolation of any water into the subsurface strata would undergo significant filtration through the shallow soil layers and bedrock that a large proportion of any pollutant would be filtered from the water before it reaches the regional groundwater table. It would require a considerable pollution incident to impact on groundwater locally and on this basis, that groundwater vulnerability at the site is considered Medium.

Historic Mining

11.4.33 Mining has historically taken place to extract coal from the bedrock geology beneath and around the site. A Coal Mining Risk Assessment is included at Appendix 11.3 to assess risk associated with the proposed development. Based on the information reviewed, the site is considered to be minerally stable with respect to the proposed development, however areas requiring further assessment are highlighted for inclusion in post consent ground investigations.

Groundwater Levels and Flow

11.4.34 NRW do not hold any groundwater level data within reasonable proximity to the site (i.e., less than 2 km). Groundwater levels have therefore been estimated based on the hydrogeological setting. Spring formations provide an indication of the piezometric surface of the groundwater locally, which on MFD is around 264 m aOD. Other springs are noted in the MB area around Tonmawr at around 184 m aOD. We would expect the groundwater table locally is in continuum with the Afon Pelenna, at around 121 m aOD in Tonmawr, from 165 m aOD at Pelenna House. We would expect flows in a westerly direction towards Neath / the coast with levels decreasing in accordance with the river profile.

Groundwater Quality

11.4.35 In consideration of the geological setting (permeable sandstones with deeper coal bands), we would expect standing groundwater levels between 165-121 m aOD past the site. There are numerous groundwater springs from the topographic slopes which feed into different mine water treatment plants. The quality of the groundwater would be heavily dependent on its interaction with the coal seams, whereby significant oxidation would have the ability to impair the local groundwater quality.

11.4.36 Based on historical mining works locally and given that groundwater springs in the vicinity of the site are captured and conveyed into Coal Authorities Mine Water Treatment Plants adjacent to the site, we would expect that groundwater is in poor condition.

11.4.37 The site falls under the Swansea Carboniferous Coal Measures Groundwater Body which has an overall status designated as 'poor' due to its chemical classification¹⁸. With regards to the quantitative assessment, the groundwater body was classified as 'good'.

Groundwater Resources and Abstractions

11.4.38 Permitted groundwater abstractions and discharges provided online by NRW and located in Figure 11-7, which indicates that there are no permitted groundwater abstractions or discharges within 2 km of the site.

11.4.39 The nearest groundwater abstractions, their use and location from the site and use are summarised below:

- 21/58/61/0039 – Groundwater Abstraction for unknown (impounding) use, c.2.5 km south west of the site.
- WA/058/0072/001 – Pumped Groundwater Abstraction for pollution remediation, 4 km north of the site.

¹⁸ Available at <https://waterwatchwales.naturalresourceswales.gov.uk/en/> [Accessed November 2022]

11.4.40 The nearest groundwater discharges, their use and location from the site and use are summarised below:

- BB4023301 – discharge of sewage to groundwater via infiltration system (non water undertaker), 4.7 km north west of the site.
- BP0238801 - discharge of sewage to groundwater via infiltration system (non water undertaker), 4.8 km north of the site near Resolven.

11.4.41 A review of NRW data indicates the site is not located in a SPZ. The closest SPZ is c.13.9 km north west of the site.

11.4.42 The sensitivity of registered abstractions and discharges is considered to be Negligible.

Private Water Supplies

11.4.43 Details of Private Water Supplies (PWS) locally are provided in Figure 11-7. This mapping indicates there is a PWS within the site boundary (Fforch Dwm Farm), and an additional three within 2 km of the site (Tonmawr Farm; Tyn Ton Farm; Gyfylchi Farm).

11.4.44 With reference to OS Mapping there appears to be a groundwater spring adjacent to the existing farm buildings at Fforch Dwm Farm and this would therefore be a viable water supply source. This spring expels from the ground at a higher elevation (c.264 m aOD) than the surrounding contaminated groundwater springs (around 184 m aOD) and therefore may be in a more favourable condition having not intercepted worked coal seams. The PWS source has been confirmed as the spring immediately above the farm (to the north) which is at a higher elevation than the proposed access track which passes the farm to the south. The PWS source is approximately 80 m from the proposed track alignment and is c.20 m higher than the proposed track in elevation. The risk to the PWS source is considered to be low from the proposed development.

11.4.45 The PWS registered at Tonmawr Farm has been confirmed by the landowner as no longer being a domestic potable water supply and is solely used for agricultural purposes. Tonmawr Farm itself is served by a mains water supply. The PWS source location is on the hill to the north of the farm, with the catchment tank located at approximately 230 m aOD, above the level of any potentially contaminated groundwaters. The supply is currently used for drinking troughs in fields below the catchment tank and supplies water for water to the outbuildings and livestock at Blaenafon Farm at the north of Tonmawr village. The source is situated approximately 50m north east of the proposed access track and the option location for the Blaenafon substation compound. The source location is elevated above any proposed infrastructure by over 5 m. The risk to the PWS source is considered to be low from the proposed development.

11.4.46 PWS at Tyn Ton Farm and Gyfylchi Farm appear to be sourced from groundwater springs locally. It is unlikely there is possibility for flows on the site to express at either of these farms due to their raised elevation and the presence of the Afon Pelenna valley which divides the site from the two more distant PWSs. Instead groundwater would enter the river as baseflow or remain at this lower elevation. On this basis, we do not consider that the site will have any potential impacts on the PWSs at Tyn Ton Farm and Gyfylchi Farm. PWS sensitivity will therefore only be assessed with regards to Tonmawr Farm and Fforch Dwm Farm.

11.4.47 The sensitivity of the two PWS sources in proximity to the site (Fforch Dwm Farm and Tonmawr Farm) are considered to be Low.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

11.4.48 Based on the National Vegetation Classification (NVC) mapping provided in the survey presented in Figure 9.4, there are a number of GWDTEs present on site. These are as follows:

- M23b - Juncus Effusus - Highly dependent GWDTE
- M25a and b - Molina Caerulea - Moderately dependent GWDTE
- M6b - Carex Rostrata - Highly dependent GWDTE
- U6 Juncus Squarrosus - Moderately dependent GWDTE

11.4.49 Based on the GWDTE mapping, almost all of the high and moderately dependent GWDTEs are situated at higher elevations on the plateaus of MFD and MB where it is understood the regional groundwater table is at depth. All proposed development is located in areas considered low/ negligible to moderately dependent GWDTE. This will result in direct habitat loss which is considered in the ecology chapter.

11.4.50 The ecosystems present which are believed to be groundwater dependent are likely fed from a combination of rainfall, surface water flows and shallow groundwater springs, where a change of slope in the topography encourages shallow subsurface flow emergence to the surface. These areas are considered to be of Medium sensitivity.

11.4.51 Retention of this hydraulic continuity is therefore essential to reduce any impacts to GWDTEs.

Hydrological Setting

Surface Water Features and Water Dependent Habitat

11.4.52 Surface water features on and in the vicinity of the proposed development are shown on Figure 11-1.

11.4.53 The site is within the surface water catchment of "Pelenna - headwaters to confluence with Afan". The Afon Pelenna is situated to the immediate south of the site and is formed from the confluence between Nant Fforch Dwm c.20 m south of the site and the Nant Blaenpelenna with flows along the northern boundary of the MFD site beneath the proposed access track and discharges into the Afon Pelenna. The Afon Pelenna catchment falls within the larger Taw to Cadoxton Management Catchment and Afan Operational Catchment. With reference to the Water Framework Directive, NRW designate the waterbody as poor with high chemical status and poor ecology.

11.4.54 Other waterbodies locally include:

- Nant Cwm-y-Pant is sourced from an incised valley at Mynydd Fforch Dwm and flows south west past the existing farm building to discharge into Nant Fforch Dwm;
- Nant Fforch Dwm flows in a south westerly direction to the south of the site and forms the Afon Pelenna at a confluence with Nant Blaenpelenna 200 m south west of the MFD area, at Pelenna House;
- Nant Blaenpelenna flows west and south along the northern and western MFD site boundary towards Pelenna House. The channel is source of numerous small tributaries 1 km north of the site, including Nant Twynpumerw. Nant Blaenpelenna forms the Afon Pelenna at a confluence with Nant Fforch Dwm;
- Afon Pelenna is designated as a Main River formed by the confluence of Nant Fforch Dwm and Nant Blaenpelenna at Pelenna House and flows in a south westerly direction away from the site to discharge into the Afon Afan c.3.7 km south west of the site;

- Nant y Cywion is a network of small drainage channels within the peatland area of MFD, at the eastern extent of the plateau. These flows drain north or north west to discharge into the headwaters of Nant Blaenpelenna;
- Gwenffrwd flows southwest from its source along Michaelston forest before heading south east toward Tonmawr. At its closest point, the channel is 205 m west of the MB area of the site and receives flows from on site tributaries (Nant Baengwenffrwd and a tributary from the MB plateau) before discharging into the Afon Pelenna at Tonmawr, 470 m south west of the site;
- Nant Baengwenffrwd flows in a westerly direction along the northern boundary of the MB area into Gwenffrwd. The channel rises within the plateau in the north west of the MB site area;
- A tributary of Gwenffrwd is sourced from the forested area to the immediate east of the plateau of the MB site area and flows west through the site into Gwenffrwd at a confluence approximately 290 m west of the site. This is shown as 'MB River' in Figure 11-1; and
- Afon Afan at its closest point, is 1.5 km south of the site and flows in a south westerly direction and joins with the Afon Pelenna at Pontrhydyfen to make the larger Afon Afan system. Afon Afan flows south west from Pontrhydyfen discharging into Swansea Bay at Port Talbot some 9.2 km south west of the site. At Cwmafan (National River Flow Archive Station Number 58004), 3.5 km south west of the site, the Afon Afan has a baseflow index of 0.44, indicating hydraulic connectivity between the watercourse and groundwater, however the watercourse is not groundwater dependent. The Afan Valley Angling Club manage fishing within the catchment, downstream of the site, between Port Talbot to Cwmafan where stocks of Brown Trout, Sea Trout and Salmon are introduced to watercourses.

11.4.55 Review of DEFRA Magic Mapping indicates there are no environmentally designated water dependent habitats within 2 km of the site. The areas of peat coverage on the site are considered to be water dependent and would be sensitive to changes to local hydrology (runoff patterns). A Soil and Peat Management Plan has been prepared as Technical Appendix 11.2. Guidance and mitigation within this plan will be established at the site to reduce any potential impacts to the peat environment.

11.4.56 It is considered that 'Ordinary Watercourses' in the vicinity of the site are sourced from surface water flows off topographic peaks and are not in hydraulic continuity with the groundwater. The larger river systems, such as the Afon Pelenna and Afon Afan, which are at lower elevations, are likely in hydraulic continuity with groundwater in the sandstone bedrock and permeable superficial deposit aquifers locally such as alluvium. Where surface water bodies and the groundwater are in continuum, we would expect some contamination of the watercourse from historical mining.

11.4.57 Groundwater spring emergence occurs at the site whereby shallow subsurface flows (piezometric surface of the shallow groundwater) intercepts the land surface. There are currently three mine water treatment plants in the vicinity of the site which are fed by groundwater springs from MFD and MB.

Surface Water Quality

11.4.58 The site lies in the surface water catchment area 'Pelenna - headwaters to confluence with Afan' (GB110058026140) which had an overall classification of 'Poor' in 2021. This is reflected by high levels of iron, manganese and copper which is assumed to be associated with previous mine workings (hydraulic connectivity with contaminated groundwater). The ecological assessment was also rated poor due a failure with regards to fish, specifically Salmon, Trout and Bullhead.

Abstractions and Discharges

11.4.59 Abstraction information provided by NRW indicates there are no surface water abstractions within 2 km of the site. The closest abstraction is 3 km west from the Afon Corrwg which discharges into the Afon Afan further downstream. There are three abstractions along this reach of the Afon Corrwg downstream of Glyncorwg which are used to supplement water levels in the neighbouring lakes.

11.4.60 There are however six licensed surface water discharges regulated by NRW within 2 km of the site as shown on Figure 11-7. The license number, effluent type and distance from the site and recorded as follows:

- BP0272601 - Discharge of Mine water from Lagoon Settlement at Whitworth Treatment System Neath, 400 m west of the site.
- BP0272501 - Discharge of Mine water from Lagoon Settlement at Whitworth Treatment System Neath, 270 m west of the site, 100 m south of BP0272601.
- BP0257801 - Discharge of Mine water at Whitworth Treatment System Neath, 370 m west of the site, 530 m south of BP0272501.
- BW2901001 – Combined Sewer Overflow into the Afon Pelenna, 570 m south west of the site.
- BP0028608 – Combined Sewer Overflow into the Afon Afan, 1.9 km south east of the site in Duffryn.
- BP0028601 - Combined Sewer Overflow into the Afon Afan, 1.9 km south east of the site in Abercregan.

11.4.61 There are three other surface water discharges in Pontrhydyfen, just outside of the 2 km buffer, of which two discharge into the Afon Afan with the other into the Afon Pelenna. These all relate to discharges from combined sewer overflows. There are no licensed discharges associated with the mine water treatment plant at Pelenna House noted on NRW website.

Flood Risk Assessment and Surface Water Management

11.4.62 An assessment of flood risk has been completed in accordance with Planning Policy Wales (PPW) and TAN15. A Flood Consequence Assessment has been prepared as part of the planning application, which is included as Technical Appendix 11.1.

11.4.63 Based on the Development Advice Map, the majority of the site lies in Flood Zone A however an area of proposed new access track over the Nant Blaenpelenna is classified as Flood Zone C2. Additionally, there are areas of elevated surface water flood risk associated with smaller river channels on the site, such as Nant y Cywon, Nant Cwm-y-Pant and the MB River tributary of Gwenffrwd which drains the plateau at the MB site area. In some of these existing surface water flow pathways, new access tracks are proposed.

Future Baseline

11.4.64 This assessment also considers the 'do nothing' scenario. The baseline environment is unlikely to change significantly under the 'do nothing' approach in terms of land use, water use and water quality.

11.4.65 Consent has been granted for forestry plantation on significant areas of the MB area of the site and some areas have already been planted out. If the proposed development were to go ahead, further planting on the MB area of the site would be progressed in line with this consent. The planting of trees on the plateau of the MB area would potentially adversely impact the superficial deposits of peat and peaty soils observed in this area.

11.4.66 United Kingdom Climate Projections 18 (UKCP18) envisages that the climate is likely to become more variable. The Welsh Governments Flood Consequences Assessments: Climate change allowances guidance indicates that the expected changes / increases to river flood flows in the West Wales River Basin for the 2050s (operational lifetime of development) using the central estimate is 25%. Peak rainfall is anticipated to increase by 10% (central estimate) and therefore changes to runoff are likely to occur on site regardless of the proposed development.

11.4.67 In consideration of the uncertainty surrounding the future baseline environment, the assessment of the current baseline environment has considered the existing conditions, however it is acknowledged that future scenarios will need to take the potential impact of climate change on the water environment into account. Mitigation measures, where applicable, do warrant consideration of climate change for structure sizing etc.

11.5 Inherent Design Mitigation

11.5.1 The proposed development has undergone design iterations and evolution in response to the geological, hydrological and hydrogeological constraints identified as part of the baseline studies to avoid and/or minimise likely effects on receptors where possible. This has included areas of deeper peat and peaty soils or areas of potential peat instability.

11.5.2 Inherent design mitigation built into the proposed development is as follows.

Peat and Peat Management

11.5.3 The extent and depth of peat has been subject to investigation on the site. Where practically possible, areas of deeper peat and peaty soils have been avoided by the site design in collaboration with NPTCBC. Further details on evolution of site design is included in Chapter 4: Scheme Description, Alternatives and Design Evolution (4.6.8). A site-specific Soil and Peat Management Plan has been prepared (see Technical Appendix 11.2) which includes mitigation measures to remove or significantly reduce potential impacts to peat on the site.

11.5.4 Peat stability has been considered within the scheme design. Peat instability can occur at any location but particularly where peat is over 1 m in depth and stability is influenced by slope gradient, underlying geology and subsurface hydrology. Mitigation proposed below will ensure there is negligible change to the subsurface hydrology and the underlying geology will not change. Areas of peat and peaty soils greater than 1 m in depth have been avoided as part of the development and peat has not been identified in sloped areas where peat slide may be prevalent. This reduces any risk of peat instability.

11.5.5 Additionally, Good construction practice and methodologies to prevent peat instability within areas that contain peat and peaty soil deposits are integrated into the scheme proposals. These include:

- measures to ensure a well-maintained drainage system, to include the identification and demarcation of zones of sensitive drainage or hydrology in areas of construction;
- minimisation of 'undercutting' of peat slopes, but where this is necessary, a more detailed assessment of the area of concern would be required;
- careful micro-siting of turbine bases, crane hardstanding and access track alignments to minimise effects on the prevailing surface and sub-surface hydrology. This has been undertaken as an iterative process in collaboration with NPTCBC whereby the majority of built infrastructure is not positioned on depths of peat and peaty soils which does not exceed 0.5 m in depth;
- raising peat stability awareness for construction staff by incorporating the issue into the Site Induction (e.g. peat instability indicators and good practice);

- introducing a 'Peat Hazard Emergency Plan' to provide instructions for site staff in the event of a peat slide (very low probability) or discovery of peat instability indicators;
- developing methodologies to ensure that degradation and erosion of exposed peat deposits does not occur as the break-up of the peat top mat has significant implications for the morphology, and thus hydrology, of the peat (e.g. minimisation of off-track plant movements within areas of peat);
- developing robust drainage systems that would require minimal maintenance; and
- developing drainage systems that would not create areas of concentrated flow or cause over-, or under-saturation of peat habitats.

11.5.6 Notwithstanding any of the above good construction practices and methodologies, detailed design and construction practices would need to take into account the particular ground conditions and the specific works at each location throughout the construction period. An experienced and qualified engineering geologist / geotechnical engineer would be appointed to provide advice during the setting out, micro-siting and construction phases of the proposed development.

Water Pollution

11.5.7 In order to reduce the potential risk of water pollution, the best practice and mitigation measures, comprising relevant Pollution Prevention Guidelines and CIRIA guidance, would be followed.

11.5.8 To minimise the risk of accidental spillage of fuels and oils or a vehicular accident occurring on-site, the following would be implemented:

- a traffic management plan to minimise potential for collisions;
- site operatives to receive induction training on risks associated with fuel and oil spills;
- a fuel and oil spill kit carried by all vehicles associated with refuelling operations;
- fuel and oil stored at the site in an appropriately bunded area with a minimum of 110% capacity and with all filling and draw points contained within the bunded areas; and
- regular routine maintenance undertaken on all vehicles.

Flood Risk

11.5.9 To minimise the risks of flooding, a Flood Consequence Assessment has been prepared and is presented in Technical Appendix 11.1.

11.5.10 Based on the Development Advice Map, the majority of the site lies in Flood Zone A however an area of proposed new access track over the Nant Blaenpelenna is classified as Flood Zone C2. Additionally, there are areas of elevated surface water flood risk associated with smaller river channels on the site, such as Nant y Cywon, Nant Cwm-y-Pant and the MB River tributary of Gwenffrwd which drains the plateau at the MB site area. In some of these existing surface water flow pathways, new access tracks are proposed.

11.5.11 Blockage of the flow pathway would increase flood risk and therefore a suitably sized flow conveyance structure, such as a culvert, will be required beneath access roads where surface water flow pathways occur, to ensure the progressive discharge of runoff downstream. This will therefore have negligible impact on flood risk at the site or

11.5.12 A new access track is proposed across the Nant Blaenpelenna upstream of Pelenna House in an area designated as Flood Zone C2. It is considered as part of this application that a new bridge crossing would be installed however this would be suitably sized so that the

watercourse can convey more extreme flood flows, does not reduce the floodplain storage (through permanent construction within the floodplain having a larger footprint than existing without compensatory storage) or increase flood risk upstream of the crossing (caused by the reduction in flow capacity from the existing to new crossing). Whilst flooding of the crossing could occur during extreme storms, this is not considered to have detrimental impacts. The design of a new crossing would be subject to Ordinary Watercourse Consent approval by NPTCBC.

11.5.13 Drainage which is provided for runoff which sheds from the new access tracks or from turbine crane pads will be provided as part of the CEMP (Technical Appendix 4.1) for the site using environmental best practice. Whilst full details of the solar development area were not released at the time of reporting, it is understood that any drainage requirements will be limited as the majority of the site will maintain the existing hydrological drainage regimes. The small areas of the site that may require drainage would use Sustainable Drainage Systems and would be subject to approval by NPTCBC in their role as the local SuDS Approving Body (SAB).

11.5.14 Provided that the proposed development will install suitably sized flow conveyance structures to support the new access tracks, and sufficient drainage is installed to counteract runoff from new impermeable areas, the risk of flooding remains low, and development of the site will have negligible impact on flood risk to areas downstream.

Groundwater Dependent Habitats

11.5.15 It has been shown that areas identified on-site as being potentially highly or moderately groundwater dependent are likely to be sustained by incident rainfall, local surface water runoff and shallow subsurface flows.

11.5.16 Areas where low to medium dependent GWDTEs are present are located within the site. These are considered a high sensitivity receptor.

11.5.17 For GWDTE there would be ideally a 100 m buffer around tracks and laydown areas/compounds and 250 m buffers around turbines. However, as GWDTE are sporadically located across the site, locating development infrastructure outside of these habitat areas was not fully practicable. Site specific mitigation measures are therefore required to prevent potential impacts to GWDTE.

11.5.18 These include measures such as permeable access tracks and regular cross track drains which have been proposed (see below) to safeguard existing water flow paths and maintain existing water quality. It is considered that the water dependent habitats identified by the NVC mapping can be sustained. This will be confirmed, in accordance with good practice, by the Ecological Clerk of Works (ECoW) at the time of the construction of the proposed development who will ensure existing surface water flow paths and water flushes are maintained.

11.6 Potential Effects

11.6.1 The proposed development scheme seeks to gain approval for the construction and operation of up to seven wind electricity generating turbines, a solar photovoltaic array and associated infrastructure, located approximately 6 km to the east of Neath and 4 km to the south of Resolven.

11.6.2 The aspects of the proposed development that have the potential to affect the geology, hydrology, hydrogeology and peat environment are detailed below in the relevant

construction, operation and decommissioning phases. This assessment also considers residual and cumulative effects of development.

Construction Phase

11.6.3 It is envisaged that the following impacts could have the potential to affect hydrological, hydrogeological, geological and soils receptors on or in the vicinity of the site during the construction phases of development:

- Importation and redistribution of construction materials with the potential for spillage of contaminating liquids from the plant operating at the site;
- Mobilisation of sediment and increased erosion during the construction process arising from extensive earthworks including the movement of sediment around the site and construction traffic;
- Removal of peat during the construction phase resulting in localised flood issues arising from peat dewatering;
- Changes to groundwater and shallow subsurface flow pathways due to excavations for tracks or foundations required for crane pads and turbines;
- Creation of new surface water flow pathways in accordance with the construction of new access tracks (including new bridge crossing) and wind farm infrastructure which may increase or alter runoff to existing receptors/ alter the local hydrology and heighten flood risk; and
- Creation of concrete basins for crane pads using cemented materials which may impact surface water and/ or groundwater quality locally due to high alkalinity of cement.

Operational Phase

11.6.4 It is envisaged that the following impacts could have the potential to affect hydrological, hydrogeological, geological and soils receptors on or in the vicinity of the site during the operational phases of development:

- Changes to groundwater and shallow subsurface flow pathways due to the concrete foundations required for turbines;
- Changes in runoff patterns associated with the crane pads reducing localised infiltration to ground;
- Changes to runoff patterns associated with the proposed solar development;
- Poor construction of watercourse crossings which may increase flood risk locally and result in scour; and
- Changes to flood storage and conveyance associated with the new access track and crossing over Nant Blaenpelenna in Flood Zone C2.

Decommissioning

11.6.5 During decommissioning phase, the impacts on hydrology, hydrogeology, geology and peat will be similar to those assessed for the construction phase. Good practice measures (similar to those identified within the CEMP) would be employed during decommissioning and would be agreed with statutory authorities at the time of decommissioning through a decommissioning plan.

Receptor Sensitivity

11.6.6 The following section discusses the sensitivity of identified receptors:

11.6.7 The sensitivity of ordinary watercourse surface water on site is assessed as 'Low', given the following:

- The receptor is not used for water supplies and there are no water-based ecological receptors or registered surface water abstractions within or downstream of the site;
- there are numerous small watercourses on and within the vicinity of the site which drain to Main Rivers; and
- the receptor is of low quality and rarity with no significant sensitivity to water based ecological function (which is at present, poor).

11.6.8 The sensitivity of groundwater in the Sandstone bedrock is assessed as 'Low', given the following:

- The site is not located in a SPZ, nor are there any within a 2 km radius;
- The underlying bedrock is classified as a Secondary A aquifer, and there are numerous spring formations on and around the site which are captured and undergo passive mine water treatment;
- The groundwater vulnerability is assessed as low risk largely due to the depth to groundwater at the site and filtration of any throughflows by the bedrock strata before reaching the groundwater table;
- There are no registered groundwater abstractions on or within 2 km of the site; Bedrock groundwater is likely to be contaminated from previous mining activity;
- The registered PWS sources and GWDTE are considered as separate receptors; and
- Ordinary watercourses on and in the vicinity of the site are not in hydraulic conductivity with the aquifer / groundwater and are sourced from surface water flows. Hydraulic connectivity exists in the downgradient main river networks however these main rivers are not groundwater dependent.

11.6.9 Table 11.6 below summarises the sensitivity of all receptors on and around the site. Due to the lack of connectivity with the site, this report scopes out the following receptors:

- Earlswood Road Cutting and Ferryboat Inn Quarries SSSI
- Crymlyn Burrows SSSI
- Crymlyn Bog SSSI SAC NNR

Table 11.6 Summary of Receptor Sensitivity

Receptor	Sensitivity	Reason for Sensitivity
Earlswood Road Cutting and Ferryboat Inn Quarries SSSI	Negligible	Located 8 km from the site and only designated for its geological properties. Scoped out of assessment.
Crymlyn Burrows SSSI	Negligible	Located 8.1 km from the site in a separate surface water catchment area, hydraulic connectivity with the site is considered unlikely. Scoped out of assessment.
Crymlyn Bog SSSI SAC NNR	Negligible	Located 10.5 km from the site in a separate surface water catchment area, hydraulic connectivity with the site is considered unlikely. Scoped out of assessment.
Soils and Geology	High	Areas of deep peat and peaty soils identified by peat probing investigation at the site.
Groundwater (aquifers)	Low	No public groundwater abstractions locally, significant depth to groundwater and any percolation would be filtered considerably by bedrock (low vulnerability).
Private Water Supplies	Medium	Assumed groundwater springs supplying water to Fforchdwm Farm and Tonmawr Farm.

Receptor	Sensitivity	Reason for Sensitivity
GWDTE	Medium	Areas of potential GWDTE have been identified by NVC mapping on the site which are potentially sustained in part by shallow subsurface flows.
Ordinary watercourses in vicinity of the site	Low	Low risk of flooding and receptor is of low quality and rarity.
Downstream Main Rivers	Medium	Main River designation with attributed fluvial flood risk, WFD objectives and surface water abstractions from downstream Main Rivers.

11.6.10 Receptors with negligible sensitivity will not be assessed further as any potential magnitude of change would be ruled as insignificant.

Potential Effects (prior to mitigation)

11.6.11 Potential unmitigated effects that may arise following the construction, operation and decommissioning of the site development are as follows:

- Changes to the hydrogeological and hydrological flow regimes and flooding;
- Erosion and sedimentation; and
- Potential changes to groundwater and surface water quality.

Hydrogeological and Hydrological Flow Regimes and Flooding

Construction Effects

11.6.12 During the site construction, it is envisaged that the following activity could impact the hydrogeological and hydrological flow regimes and flooding:

- Creation of new surface water flow pathways in accordance with the construction of new access tracks, the solar array and wind farm infrastructure which may alter or increase runoff to existing receptors/ alter the local hydrology and heighten flood risk; and
- The removal of peat during the construction phase resulting in environmental degradation and localised flood issues arising from peat dewatering.

11.6.13 The following sections paragraphs will assess these potential impacts with regard to each receptor.

Ordinary Watercourses in vicinity of the site

11.6.14 The proposed access tracks are, in places, set out perpendicular to the prevailing topography and therefore overland flows from the upgradient land would potentially be able to progress onto the road and become channelised along the road. The design will incorporate drainage to intercept and manage surface water runoff and will ensure local catchment regimes are maintained through regular dispersal of runoff to vegetated downgradient areas.

11.6.15 The small channels on and around the site are sourced from on-site runoff and therefore any changes to the hydrology of these regimes will have the potential to directly impact on downgradient flows within these systems. For instance, tributaries of Nant y Cywon are sourced on site in an area where access tracks and infrastructure to support turbine construction are proposed. Potentially, flows which typically drain into the stream from these areas and from upgradient land would be intercepted by surface water drainage designed to

manage runoff from construction areas. Discharge from these areas will be downgradient of construction works, ensuring that flows are discharged diffusely to mimic the existing regime.

- 11.6.16 The diffuse discharge of surface water flows will mimic the existing runoff regime having negligible impact on a low sensitivity receptor and therefore Minor effect, which is not significant in EIA terms.

Downstream Main Rivers

- 11.6.17 The development of new impermeable areas could impact on runoff rates from the site (hydrological regime), which would result in elevated flood risk from fluvial and surface water sources. Surface water drainage will be detailed as part of the CEMP and will be installed prior to development. The drainage infrastructure will be appropriately sized by a Civil Engineer and will ensure there is no change to local sub-catchment hydrology and increase in runoff to downgradient areas. Any culvert design will follow guidance in the CIRIA Culvert Design and Operation Guidance to convey and attenuate extreme surface water flows with an allowance for climate change, in line with the climate change uplifts provided by NRW contained in the FCA.

- 11.6.18 With these measures implemented, quantitative changes in runoff into main river receptors locally will be negligible, resulting in a Negligible effect which is not significant in EIA terms.

Soils and Geology

- 11.6.19 Peat deposits have been identified on the site and any disruption to surface water and shallow subsurface flows would have the potential to negatively impact these ecosystems. Cross track drains and permeable compound and road surfaces are proposed to reduce the impermeable nature of the site development and enhance infiltration to ground. Cross track drains at regular frequencies in the vicinity of sensitive receptors will ensure minimal disruption to the hydrology of downgradient habitat. Adoption of diffuse discharge of flow from the cross-track drainage will promote improvements to water quality from construction areas and will avoid potential issues of waterlogging arising from a point outfall. Such measures will safeguard existing surface water flow pathways on the site and will be retained and maintained throughout the construction and operational phases.

- 11.6.20 The peat deposits (soils and geology) are a high sensitivity receptor. Adherence to the Soil and Peat Management Plan (Technical Appendix 11.2) and use of cross track drains and permeable surfaces will reduce potential impacts to surface water flows on site to consequently reproduce a runoff pattern that mimics the existing regime. Excavated material will be stored temporarily on site prior to reuse for restoration at the edge of construction areas, reinstatement of temporary construction areas and in habitat restoration and management as discussed in the Outline Habitat Management Plan (Appendix 9.4). This results in a negligible magnitude of change on a high sensitivity receptor and the effect is Minor, which is not significant in EIA terms.

- 11.6.21 Without mitigation, the removal of peat during the construction phase may result in environmental degradation and localised flood issues arising from peat dewatering. The site design has been established through an informative iterative process with the aim of positioning all infrastructure in areas where peat depth is less than 0.5 m (see Figure 4.4, and design iteration ES paragraphs 4.6.16 - 19). The majority of the scheme design have had to be situated in areas of shallower peat or peaty soils (less than 0.5 m deep) and will therefore require excavation. Due to other site constraints, there are some small and very localised areas of the site where infrastructure will be positioned on areas of peat or peaty soils with

depths greater than 0.5 m. No infrastructure is situated on areas where depths of peat or soils are greater than 1.0 m depth.

11.6.22 Evidently, excavation of peat in any instance will result in some disruption to the ecological habitat and the potential for loss in carbon reserves. The Soil and Peat Management Plan (Appendix 11.2) details the volumes of peat and soils that will be excavated to facilitate construction of different elements of the proposals. The plan also sets out how peat and soils will be reused on site following construction, with the majority of excavated material being used for restoration at the edge of construction areas and reinstatement of temporary construction areas. The plan currently details a small volume of peat and soils that will remain and will be used in habitat restoration as set out in the Outline Habitat Management Plan (Appendix 9.4). Adherence to guidance set out in the Soil and Peat Management Plan will ensure no net loss of peat from the site.

11.6.23 Carbon calculations have been undertaken at the site which demonstrate that the works on site involving peat is offset by the reduction in carbon emissions associated with the renewable energy development (Technical Appendix 11.4, Section 3.0).

11.6.24 Without mitigation, the excavation process may actively dewater the peat within the area causing localised flood issues (surface water ponding) within the construction area. It is therefore essential that the upgradient peatlands are maintained in terms of quality and water availability so that water within the soils does not seep out onto the construction areas, or throughout the development lifetime.

11.6.25 With good peat mitigation practices, the magnitude of change would be negligible on a high sensitivity receptor, and therefore a Minor effect and is therefore not significant in EIA terms.

GWDTE

11.6.26 GWDTE habitats have been identified on the site and any disruption to surface water and shallow subsurface flows would have the potential to negatively impact these ecosystems. Cross track drains and permeable compound and road surfaces are proposed to reduce the impermeable nature of the site development and enhance infiltration to ground. Cross track drains at regular frequencies in the vicinity of sensitive receptors will ensure minimal disruption to the hydrology of downgradient habitat. Adoption of diffuse discharge of flow from the cross track drainage will promote improvements to water quality from construction areas and will avoid potential issues of waterlogging arising from a point outfall. Such measures will safeguard existing surface water flow pathways on the site and will be retained and maintained throughout the construction and operation phases.

11.6.27 GWDTE are considered medium sensitivity receptor, and in line with Table 11.2, the magnitude of impact is assessed as negligible, resulting in a Minor effect and therefore not significant in EIA terms.

Operational Effects

11.6.28 During the site operation, the following potential impacts could affect the hydrogeological and hydrological flow regimes and flooding:

- Changes to groundwater and shallow subsurface flow pathways due to the concrete foundations required for turbines, foundations for access track infrastructure and the presence of buried cable trenches;
- Changes in runoff patterns associated with the turbines reducing localised infiltration to ground; and
- Changes to runoff patterns associated with the proposed solar development.

Ordinary Watercourses in vicinity of the site

- 11.6.29 Changes to runoff patterns associated with the proposed turbines, access tracks and solar development could occur as a result of increased impermeable areas and the layout of the PV array, impacting upon Ordinary Watercourses on and in the vicinity of the site.
- 11.6.30 The PV modules are set in an array sloping in one direction which creates a drip line, whereby surface water channelises between each panel on the array. PV modules are not considered to directly increase runoff from the site however the interference with the drip line may alter surface water flow pathways through the site.
- 11.6.31 Changes to runoff patterns following the development would be mitigated by maintaining vegetation beneath the PV module array and through a surface water drainage strategy using SuDS, for areas of the development with impermeable areas or areas of development which will require management of surface water runoff. The drainage strategy for the site will ensure that runoff from the site does not increase as a result of the development. Potential impacts on Ordinary Watercourses would be minimal as hydrological regimes will be maintained. This is a low sensitivity receptor with a negligible magnitude of change, and therefore a Negligible effect and not significant in EIA terms.

Groundwater

- 11.6.32 The proposed development has the potential to induce changes to groundwater and shallow subsurface flow pathways due to the concrete foundations required for turbines and the presence of access tracks.
- 11.6.33 The construction of turbines typically involves excavating a large void and infilling with cemented materials to create a solid turbine base. This therefore means that shallow subsurface lateral flows through the site would be constricted by the foundations of the turbines. The depth of the foundations is not considered enough to have any impact on the groundwater flows in the bedrock saturated zone.
- 11.6.34 Whilst there may be some flow constriction, the turbines are all located in areas of flat topography and therefore shallow subsurface flows can be routed around the foundations. This would be more problematic if the foundations were located on a slope and upgradient flows were not able to progress downstream and would instead result in spring emergence and localised groundwater flood issues.
- 11.6.35 The micrositeing of turbines away from sloped areas or areas of low-lying topography where groundwater flow is more prevalent means that measures to reduce impacts on subsurface flows are inherent in the scheme design. It is considered the potential effects to shallow subsurface flow pathways and subsequent effect on groundwater at turbine locations is a low magnitude of change on a low sensitivity receptor and therefore the effect is Minor and not significant in EIA terms.
- 11.6.36 The proposed development also has the potential to cause changes in runoff patterns associated with the turbines reducing localised infiltration to ground.
- 11.6.37 The turbine foundations are impermeable and therefore incidental rainfall which would previously have infiltrated to ground will run overland increasing localised runoff from the site whilst reducing natural groundwater recharge.
- 11.6.38 SuDS features will be used to provide drainage at the site whilst seeking to discharge surface water flows to their existing receptor and maintaining existing hydrological regimes. Drainage from turbine areas will therefore use infiltration techniques to maximise groundwater recharge

as much as possible locally. These measures will be implemented in line with details within the CEMP providing mitigation of potential impacts.

11.6.39 The use of SuDS features and infiltration drainage ensures that runoff rates from the site and recharge rates mimic the existing regime. This is therefore considered a low magnitude of change on a low sensitivity receptor, and therefore the effect is Minor and is not significant in EIA terms.

Decommissioning Effects

11.6.40 During decommissioning phase, the impacts on hydrology, hydrogeology, geology and peat will be similar to those assessed for the construction phase.

Effects of Erosion and Sedimentation

Construction Effects

- Mobilisation of sediment during the construction process arising from extensive earthworks including the movement of sediment around the site and from construction traffic;
- Poor construction of watercourse crossings which may increase flood risk locally and result in scour; and
- Changes to flood storage and conveyance associated with the new access track and crossing over Nant Blaenpelenna in Flood Zone C2.

Ordinary Watercourses in the vicinity of the site

11.6.41 The conclusions of the FCA (Technical Appendix 11.1) detail that any new watercourse crossings or flow conveyance structures (for surface water flows) must be suitably sized in line with climate change allowances (10% uplift on peak rainfall; 25% uplift on peak river flows) to ensure the prevailing flood risk is not exacerbated. If these structures are poorly designed and do not consider channel morphology, significant scour could occur which could lead to stability issues and failure which would potentially increase flood risk locally.

11.6.42 The water crossing over Nant Blaenpelenna and other flow conveyance structures required for surface water flow progression will be built in consideration of the respective watercourse or surface water flow morphology and of solid construction, reducing the likelihood and associated impacts of scour.

11.6.43 The potential new watercourse crossing over the Nant Blaenpelenna in an area designated as Flood Zone C2. It is not permitted to alter the flood storage within the floodplain, and this may occur, alongside changes to conveyance, with the implementation of a poorly designed and constructed crossing.

11.6.44 If the new structure is larger than existing and actively protrudes into the floodplain, it is possible that the new crossing could remove current flood storage areas which would then impact / increase flood risk locally.

11.6.45 Additionally, if the new structure has a smaller flow capacity than existing, and is not built for purpose during extreme events, changes to flood conveyance could occur as water would back up into the upgradient catchment and overtop the road to discharge downstream. Whilst flooding of the road may not be significantly problematic (unmanned site), these potential changes to flood storage and conveyance would not be permitted by NRW.

11.6.46 Any crossing installations would be agreed with NPTCBC through an Ordinary Watercourse Consent application prior to construction to ensure these potential issues (loss of flood storage, impact on flood flow conveyance, scour) do not arise. On this basis, the flood and scour impacts following the construction of new crossings and culverts would be considered a low magnitude of impact to a low sensitivity receptor (small watercourses in vicinity of the site) and is therefore a Minor effect and not significant in EIA terms.

Downstream Main Rivers

11.6.47 It is understood that the mobilisation of sediment during the construction site may impact downstream Main Rivers which the Ordinary Watercourses on site drain to. Whilst this would also impact the Ordinary Watercourses, the Main Rivers are of greater sensitivity and therefore this assessment conservatively assesses the worst-case scenario. The impacts to Ordinary Watercourses or Main Rivers would be the same however the significance of effect would inherently be greater for the Main River network.

11.6.48 Good practice measures for the management of erosion and sedimentation mobilisation have been set out in a Soil and Peat Management Plan (Technical Appendix 11.2). This will also include the following:

- all stockpiled materials will be located out with a 50 m buffer from watercourses, including on upgradient sides of tracks and will be battered to limit instability and erosion;
- stockpiled material will either be seeded or appropriately covered, minimising the area of exposed bare ground;
- monitoring of stockpiles / excavation areas during rainfall events;
- water will be prevented as far as possible from entering excavations through the use of appropriate cut-off drainage;
- where this is not possible, water that enters excavations will pass through a number of settlement lagoons and silt/sediment traps to remove silt prior to discharge into the surrounding downgradient drainage system. Detailed assessment of ground conditions will be required to identify locations where settlement lagoons will be feasible;
- clean and dirty water on-site will be separated, and dirty water will be settled or filtered before discharging from work areas and entering any watercourse network;
- if the material is stockpiled on a slope, silt fences will be located at the top of the slope to reduce sediment transport;
- the amount of ground exposed, and the time period during which it is exposed, will be kept to a minimum, with appropriate drainage in place to prevent surface water entering deep excavations. This drainage will be detailed within the CEMP;
- Design of drainage systems and associated measures to minimise sedimentation into natural watercourses will be developed - this may include settlement areas, silt traps, check dams and/or diffuse drainage discharge;
- silt/sediment traps, single size aggregate, geotextiles, buffer strips or straw bales will be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment will be avoided during periods of heavy rainfall or near areas of standing water where possible;
- construction personnel and the Principal Contractor will carry out regular visual inspections of watercourses to check for suspended solids; and
- the movement of construction traffic would be controlled to minimise soil compaction and disturbance. Vehicles movements outside of the designated access tracks would be avoided as much as is practicably possible.

11.6.49 Location specific good practice measures will be in place for sediment control to reduce the amount of fine sediment that could potentially enter a watercourse if not managed

appropriately. These measures will be dependent upon the final design and stone quality, but will potentially include cut-off drainage, sediment traps, sediment lagoons and flocculation stations.

11.6.50 Similar good practice measures will be required around the track and hardstanding construction activities.

11.6.51 It is considered that the implementation of the above measures is sufficient to mitigate sedimentation impacts on small watercourses in the vicinity of the site which would potentially convey this water drain to Main Rivers. The downstream Main Rivers are considered a medium sensitivity receptor however the magnitude of change is assessed as low. This is therefore a Minor effect and not significant in EIA terms.

Operational Effects

11.6.52 There are no impacts from erosion and sedimentation at the operational site which would not be prevalent in / specific to the construction phase (i.e., erosion of flow conveyance structures).

Decommissioning Effects

11.6.53 During decommissioning phase, the impacts on hydrology, hydrogeology, geology and peat will be similar to those assessed for the construction phase.

Potential Effects of Groundwater and Surface Water Quality

Construction Effects

11.6.54 During the site construction, the following have the potential to effect groundwater and surface water quality:

- Importation and redistribution of construction materials with the potential for spillage of contaminating liquids from the plant operating at the site;
- Pollution runoff from excavated and stockpiled materials during site preparation and excavation works; and
- Creation of hardstanding (concrete wind turbine foundations) using cemented materials that are highly alkaline (pH13) with potential for leaching into and contamination of groundwater and PWSs resulting in alterations to pH/ the water chemistry.

Ordinary Watercourses

11.6.55 It is understood that Ordinary Watercourses could be impacted during a pollution incident. Consequently, the risk of a pollution incident occurring will be managed using industry standard good practice. Good practice measures in relation to pollution prevention will include the following:

- refuelling will take place at least 50 m from watercourses and where possible it will not occur when there is risk that oil from a spill could directly enter the water environment. For example, during periods of heavy rainfall or when standing water is present;
- foul water generated on-site will be managed in accordance with best practice and be drained to a sealed tank and routinely removed from site;
- drip trays will be placed under vehicles which could potentially leak fuel/oils when parked;

- areas will be designated for washout of vehicles which are a minimum distance of 50 m from a watercourse and away from any surface water flow pathways which may enter the sensitive habitat areas or a PWS spring;
- washout water will also be stored in the washout area before being treated and disposed of;
- if any water is contaminated with silt or chemicals, run-off will not enter a watercourse directly or indirectly without treatment;
- water entering excavations will be prevented as far as possible; and
- a plan for dealing with spillage incidents will be designed prior to construction, and this will be adhered to should any incident occur, reducing the effect as far as practicable in line with NRW Guidance for Pollution Protection – Works and maintenance in or near water, version 1.2, February 2018 (GGP5). This will be included in the final CEMP.

11.6.56 Given the pollution prevention measures that will be employed, it is considered that the magnitude of change on surface water quality (low sensitivity receptor / Ordinary Watercourses) due to spillage of fuels, lubricants and other potentially contaminative liquids would be negligible. This would mean a Negligible effect which is not significant in EIA terms.

Downstream Main Rivers

11.6.57 During the construction phase, there is potential for polluted sediments to become entrained within surface water. Sediment would discharge via Ordinary Watercourses into downstream Main Rivers. Sediments could enter runoff from:

- Unconsolidated earthworks;
- Stockpiles; and
- Construction materials.

11.6.58 The baseline assessment has confirmed that downstream surface water (Pelenna - Headwaters to Afan) is of poor condition largely due to previous mining activity on and in vicinity of the site.

11.6.59 Any contamination which may be mobilised and transported into surface waters (through surface water runoff) would be of low concentration (due to strict measures already implemented) and significantly diluted having a negligible impact on water quality.

11.6.60 This is therefore a negligible impact on a on medium sensitivity receptor and this means a Negligible effect which is not significant in EIA terms.

Groundwater

11.6.61 The baseline assessment has confirmed that groundwater (Swansea Lower Carboniferous Measures) is poor condition largely due to previous mining activity on and in vicinity of the site. Any spillage or runoff into groundwater sources would undergo considerable filtration (through vegetation and shallow geological layers) and dilution prior to percolation into the active water table and therefore should not detrimentally impact upon the already poor quality of groundwater resources locally.

11.6.62 Additionally, given the pollution prevention measures that will be employed as per Paragraph 11.6.55, it is considered that the magnitude of change on groundwater (low sensitivity receptor) due to spillage of fuels, lubricants and other potentially contaminative liquids would be negligible and of very low risk. This would mean a Negligible effect which is not significant in EIA terms.

- 11.6.63 It is understood that there are potential impacts arising from the creation of concrete basins (concrete wind turbine foundations) using cemented materials that are highly alkaline (pH13) with potential for leaching into and contamination of the water environment resulting in alterations to pH/ the water chemistry.
- 11.6.64 Good practice measures with regards to pollution prevention will be followed for the movement of cement materials on and around the site to mitigate the likelihood of a pollution incident reducing the risk to surface water supplies (mobilised by heavy rainfall).
- 11.6.65 Cemented materials must therefore be avoided on the site during periods of heavy rainfall where alkaline runoff may flow into watercourses and discharge into groundwaters locally. Such a pollution incident could be detrimental to downstream fish stocks and the chemical composition of waterbodies on and downstream of the site.
- 11.6.66 The cemented materials will be used to infill excavations and create the turbine foundations. These materials are highly alkaline and could leach into groundwater resources.
- 11.6.67 In order to prevent leaching into groundwater, the foundations will be lined with a cap (equivalent to a landfill cap) likely of an acidic clay substrate which will prevent any groundwater interference but assist to neutralise the alkalinity of the cement materials in the event that leaching occurs.
- 11.6.68 Adherence to the mitigation measures with regards to potential pollution incidents from cement reduces the magnitude of an event to negligible on a low sensitivity receptor (groundwater) and is therefore a Negligible effect which is not significant in EIA terms.

Private Water Supplies

- 11.6.69 There are PWS fed from groundwater springs at Fforch Dwm and Tonmawr Farm. It is understood that the PWS at Tonmawr farm is for agricultural purposes only and Tonmawr Farm is supplied by mains water supply infrastructure. It is noted that no proposed infrastructure is located in the immediate vicinity where PWS sources are located and therefore potential impacts could only arise within the upstream groundwater spring zone of influence (i.e., limited on site extent).
- 11.6.70 The groundwater springs form where the land surface cuts the piezometric head of the groundwater (typically shallow groundwater flows). Whilst these groundwater flows are somewhat near surface, the incident rainfall infiltrated to ground has undergone filtration through the vegetation, shallow surface soils and upper bedrock layers prior to emerging as a groundwater spring. A pollution event is also considered unlikely following adherence to guidance detailed in Paragraph 11.6.55.
- 11.6.71 The removal of pollutants via percolation through vegetation, soils and upper bedrock layers, means that the effects of a pollution incident would have a low to negligible impact on the PWS which are classed as having a medium sensitivity, and therefore of Minor or Negligible effect which is not significant in EIA terms.
- 11.6.72 As discussed in Paragraph 11.6.63, there is potential for alterations to groundwater chemistry (pH) due to the use of highly alkaline cemented materials to create wind turbine foundations. The preventative measures detailed above with regards to adherence to pollution best practice and using a clayey acidic cap around the turbine base will prevent alkaline waters entering groundwater resources and consequently, PWS locally.
- 11.6.73 This is therefore a negligible potential impact on a medium sensitivity receptor (PWS), resulting in a Negligible effect and therefore not significant in EIA terms.

Operational Effects

11.6.74 It is not considered that there are any individual operational effects on groundwater and surface water quality which are not established in the construction phase.

Decommissioning Effects

11.6.75 During decommissioning phase, the impacts on hydrology, hydrogeology, geology and peat will be similar to those assessed for the construction phase.

11.7 Additional Mitigation

11.7.1 There are no predicted significant effects under the terms of the EIA Regulations. Other than the good practice measures that the developer would implement as standard (and as described above), no specific mitigation, during construction, is identified to be required.

11.7.2 Prior to construction a programme of baseline surface water monitoring will be completed (and be specified within the final CEMP) to confirm baseline water quantities and quality. Regular monitoring of the PWS locally (Tonmawr Farm, Fforch dwm Farm) is required pre-construction (to establish baseline conditions), during construction and then into the early operational phase. This data will be used to provide a monitoring record to which monitoring data collected during construction and operation of the wind farm can be compared to and assessed. The CEMP would also specify trigger levels and an action plan should a variance of water quality be recorded compared to baseline conditions.

11.7.3 The monitoring programme may include groundwater monitoring within areas of deeper peat noted on the plateau at MB and within the peat noted to the east of Turbine T2.

11.7.4 The responsibility of the monitoring lies with the site operators. Failure to comply with the advised water quality monitoring could lead to unknown environmental degradation.

Construction Phase

11.7.5 During the construction phase of the proposed development, a range of measures will be implemented to safeguard the water environment as part of the SPMP and CEMP. These measures are considered to be embedded mitigation as set out in 11.5.

11.7.6 No further mitigation measures are considered necessary for the construction phase.

Operational Phase

11.7.7 During the operational phase of the proposed development, routine maintenance of infrastructure would be required. This may include work such as maintaining drainage devices, removing sedimentation from structures and turbine maintenance.

11.7.8 Should any maintenance be required onsite during the operational life of the project which would involve potential impact on the water environment, measures to minimise risk would be defined in a site operations plan.

Decommissioning

11.7.9 During decommissioning phase, the impacts on hydrology, hydrogeology, geology and peat will be similar to those assessed for the construction phase. Good practice measures (similar to those identified within the CEMP) would be employed during decommissioning and would be agreed with statutory authorities at the time of decommissioning through a decommissioning plan.

11.8 Residual effects

- 11.8.1 This chapter has assessed the likely significance of effects of the Proposed Development on the geology, hydrology, hydrogeology and peat of the study area.
- 11.8.2 As a consequence of the site design, the proposed development has been assessed as having no significant effects following adoption of good practice measures.
- 11.8.3 No residual effects, either during construction or operation of the proposed development, have been identified.

11.9 Implications of Climate Change

- 11.9.1 The UKCP18 climate change predictions project that rainfall intensity, sea level, peak river flow, and extreme wave heights are all expected to increase in the future as a result of climate change. The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios.
- 11.9.2 Concerns relating to offshore wind speed and wave height are only of relevance in contexts that are in direct proximity to the open coast or other large bodies of water. The main areas of risk to the site arise from increased rainfall intensity and peak fluvial flows.
- 11.9.3 Using guidance published by NRW¹⁹ in September 2021, peak rainfall intensity is anticipated to increase by 10% using the central estimate during the operational lifetime of development. Similarly, peak fluvial flows in western Wales using the central estimate are projected to increase by 25%.
- 11.9.4 These climate change allowances must be incorporated into the design of drainage devices, flow conveyance structures and watercourse crossings to ensure longevity over the operational lifetime of development and reduce future flood risks.
- 11.9.5 Provided that all flow conveying structures are appropriately sized, flood risks to the development will remain low. It is inevitable that some changes to the hydrological regime will occur as a result of climate change irrespective of the development.

11.10 Cumulative effects

- 11.10.1 A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the proposed development in combination with other proposed developments which are likely to affect surface water, groundwater or geology (inc. peat and soils).
- 11.10.2 Proposed developments (consented and in planning) within the same catchment as the site and within a 5 km radius have been considered. It should be noted that all schemes currently in operation, consented or in planning will be managing their own potential effects so that they have minor and / or negligible impacts on water environment receptors locally.
- 11.10.3 The site is situated in an area where there are several windfarms in operation. As identified in Figure 4.1, Pen y Cymoedd wind farm (ID 1) is located 400 m from the site and is currently

¹⁹ Flood Consequences Assessments: Climate Change allowance. Natural Resources Wales, September 2021

operational. Water quality monitoring is undertaken on Nant y Cywon and Nant Fforch Dwm as part of the mitigation strategy at Pen y Cymoedd. Water quality sampling and analysis is also proposed at Mynydd Fforch Dwm and therefore impacts from either scheme would be identifiable and rectified at the site.

- 11.10.4 Based on professional judgement of wind farm sites, the most prevalent effects occur during the construction phase and there are a very limited number of impacts during operation. Minor or Negligible impacts during the construction phase at Mynydd Fforch Dwm are unlikely to create Moderate effects (significant change) alongside Negligible impacts at Pen y Cymoedd.
- 11.10.5 Fynnon Oer is an operational wind farm also located within the Pelenna - headwaters to confluence with Afan surface water catchment but upstream of the site. Negligible impacts arising from the operational state of Fynnon Oer paired with Minor or Negligible impacts from the construction at Mynydd Fforch Dwm will result in Negligible impacts overall.
- 11.10.6 SuDS measures are proposed at the site. These measures, and the best practice mitigation measures (see below) will manage the quality and quantity of the runoff generated and shed from site and will prevent any cumulative effects occurring. The cumulative effects of both the proposed development on the catchment would be negligible. There is no requirement for further mitigation beyond that set out in this report to reduce already Negligible/ Minor effects.
- 11.10.7 Melin Court wind farm is located 2.6 km from the site in the surface water catchment of Neath - confluence with Nedd Fecham and Mellte to tidal limit, which is a separate surface water catchment area to Mynydd Fforch Dwm. Whilst the site is in the same groundwater catchment, we would expect that any groundwater flows in the Swansea Carboniferous Coal Measures catchment progress west towards the coast and / or abstractions and therefore flows between the sites would not interact. On this basis, there are no potential cumulative effects from the site and Melin Court.
- 11.10.8 The remaining wind farm developments in proximity to the site are located in separate surface water catchments to the site. Given the distance between the development and the sites (over 2 km) it is considered unlikely groundwater flows will interact. On this basis, cumulative impacts are negligible, and no further mitigation is required.
- 11.10.9 Wildfox Resort (ID 32) is a consented resort complex 3.2 km from the site comprising lodges, apartments, hotels and leisure/recreational activities. Wildfox Resource is in a separate surface water catchment to Mynydd Fforch Dwm but is located upstream of the site within the same groundwater catchment. Consent was granted in January 2022 with a 3-year timeframe for the development to be constructed. Groundwater locally is considered a low sensitivity receptor and both sites will have embedded mitigation in the construction phase to reduce any potential impacts. Whilst both sites could be in their construction phases at an equivalent time, Minor impacts on a low sensitivity receptor are considered not significant. Cumulative effects have been considered and are concluded as having Minor effect and therefore not significant in EIA terms.

11.11 Summary

- 11.11.1 This chapter presents a detailed review of the site hydrological, hydrogeological and geological settings. The review has included data and information held by NPTCBC and NRW, as well as the findings from detailed and site-specific investigations.
- 11.11.2 The proven baseline conditions have informed the site design. For example, areas of deep peat and peaty soils have been avoided to reduce the requirement for excavation. Changes to the site layout have been undertaken on an iterative process in collaboration with NPTCBC.

11.11.3 The assessment has concluded that all potential impacts are not significant, provided that best practice guidance and mitigation measures are implemented. A summary of the assessment is set out in Table 11.7.

11.12 References

- The Groundwater Directive (2006/118/EC) and Water Framework Directive (2000/60/EC);
- The Environmental Permitting (England and Wales) Regulations (2016) (EPR), which includes controls to protect groundwater quality by preventing inputs of Hazardous Substances and limited pollution from Non-Hazardous Pollutants under the Water Framework Directive;
- Land Drainage Act 1991;
- Flood and Water Management Act (2010), which introduces powers for local authorities to manage flood risk;
- Planning Policy Wales (PPW);
- Water Supply (Water Quality) Regulations (Wales) 2018;
- NPTCBC Local Flood Risk Management Strategy (2013); and
- NPTCBC Local Development Plan (2011 – 2026)
- Strategic Flood Consequences Assessment (2014);
- Policy M1 – Development in Mineral Safeguarding Areas; and
- Policy RE1 – Criteria for the Assessment of Renewable and Low Carbon Energy Development.
- TAN 15 - Development and Flood Risk (2004).
- Climate change allowances and flood consequence assessments, NRW (2021);
- Control of Water Pollution from Construction Sites (C532), Construction Industry Research and Information Association (CIRIA) 2001;
- Environmental Good Practice on Site (C741), CIRIA 2015;
- Control of Water Pollution from Linear Construction Projects: Site Guide (C649), CIRIA 2006;
- Control of Water Pollution from Linear Construction Projects (C648), CIRIA 2006;
- NRW's Guidance for Pollution Protection – Works and maintenance in or near water, version 1.2, February 2018;
- The Suitable Drainage System (SuDS) Manual (C753), CIRIA 2015.
- Guidance for Pollution Prevention (GPP) which will replace the Pollution Prevention Guidelines (PPG) adopted by NRW, SEPA and the Northern Ireland Environment Agency:
- PPG01: General guide to the prevention of water pollution;
- GPP5: Works and maintenance in or near water;
- PPG06: Working at construction and demolition sites; and
- GPP21: Pollution incident response planning.
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- Spatial Flood Defence data and mapping;
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- British Geological Survey (2022) GeoIndex Onshore, GEOINDEX - British Geological Survey. Available at: <http://mapapps2.bgs.ac.uk/geoindex/home.html> (Accessed: November 23, 2022).
- Geology – artificial ground, mining, superficial deposits, bedrock;
- Borehole data;
- Aquifer designation and groundwater vulnerability.
- DEFRA (2022) Magic Map, MAGIC. Available at: <https://magic.defra.gov.uk/> (Accessed: November 23, 2022). ;
- Groundwater Source Protection Zones (SPZ);
- Statutory and non-statutory environmental designations;
- UK Centre for Ecology and Hydrology (2022) National River Flow Archive. Available at: <https://nrfa.ceh.ac.uk/data/search> (Accessed: November 23, 2022). Cranfield Soil and
- Cranfield University (2022) National Soil Resources Institute. Soilsclapes, LandIS. Available at: <http://www.landis.org.uk/soilsclapes> (Accessed: November 23, 2022).

Table 11.7 Summary of effects

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Construction Phase					
Ordinary Watercourses in vicinity of the site	Creation of new surface water flow pathways which may change local hydrological regimes and affect downstream watercourses.	Minor	Adherence to industry standard good practice and design to incorporate appropriate drainage to maintain local hydrology.	Minor	Not significant
Downstream Main Rivers	Introduction of new impermeable areas could result in elevated flood risk from fluvial and surface water sources.	Negligible	Surface water drainage will be implemented as part of the CEMP and will be installed prior to development.	Negligible	Not significant
Soils and Geology	Excavation of peat could result in environmental degradation and carbon release.	Minor	The site design process has ensured that the level of peat extraction is minimised. Appropriate peat management practice will be adhered to minimising loss of peat resources. Adherence to Guidance in the Soil and Peat Management Plan.	Minor	Not significant
GWDTE	Creation of new surface water flow pathways which may change local hydrological regimes and affect downstream GWDTE.	Minor	Adherence to industry standard good practice and design to incorporate appropriate drainage to maintain local hydrology.	Minor	Not significant
Ordinary Watercourses in vicinity of the site	Mobilisation of sediment during the construction process arising from extensive earthworks	Minor	Adherence to industry standard good practice and guidance as well as measures defined in the Soil and Peat Management Plan.	Minor	Not significant
Ordinary Watercourses in vicinity of the site	Poor construction of watercourse crossings which may increase flood risk locally and result in scour.	Minor	Adherence to industry standard good practice and Ordinary Watercourse Consent for all new crossings.	Minor	Not significant
Ordinary Watercourses in vicinity of the site	Changes to flood storage and conveyance associated with the new access track and crossing over Nant Blaenpelenna.	Minor	Adherence to industry standard good practice and Ordinary Watercourse Consent for all new crossings.	Minor	Not significant
Downstream Main Rivers	Mobilisation of sediment during the construction process arising from extensive earthworks	Minor	Adherence to industry standard good practice and measures defined in the Soil and Peat Management Plan.	Minor	Not significant

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Ordinary Watercourses in vicinity of the site	Importation of construction materials with the potential for spillage of contaminating liquids from plant operating at the site.	Negligible	Adherence to industry standard good practice and measures defined in the CEMP.	Negligible	Not significant
Ordinary Watercourses in vicinity of the site	Polluted runoff from excavated and stockpiled materials during site works.	Negligible	Adherence to industry standard good practice and measures defined in the CEMP.	Negligible	Not significant
Downstream Main Rivers	Polluted runoff from excavated and stockpiled materials during site works.	Negligible	Adherence to industry standard good practice and measures defined in the CEMP.	Negligible	Not significant
Groundwater	Importation of construction materials with the potential for spillage of contaminating liquids from plant operating at the site.	Negligible	Adherence to industry standard good practice and measures defined in the CEMP.	Negligible	Not significant
Groundwater	Polluted runoff from excavated and stockpiled materials during site works.	Negligible	Adherence to industry standard good practice and CEMP.	Negligible	Not significant
Groundwater	Potential leaching of cement materials that are highly alkaline.	Negligible	Adherence to industry standard good practice and lining of foundation excavations prior to concrete pouring.	Negligible	Not significant
Private Water Supplies	Potential leaching of cement materials that are highly alkaline.	Minor or Negligible	Adherence to industry standard good practice and lining of foundation excavations prior to concrete pouring. Water quality monitoring to be undertaken prior and during construction.	Minor or Negligible	Not significant
Operation Phase					
Ordinary Watercourses in vicinity of the site	Changes to existing runoff patterns due to the PV array layout.	Negligible	Maintain vegetation below the solar array and implementation of a surface water drainage strategy.	Negligible	Not significant
Groundwater	Interruption to shallow groundwater flow regimes through the construction of turbine foundations.	Minor	Site design has ensured turbines are located on shallower peat and on flat ground. Appropriate site drainage will ensure shallow hydrogeological regimes are maintained.	Minor	Not significant
Groundwater	Impermeable turbine foundations will reduce groundwater recharge.	Minor	A site drainage scheme using SuDS will maximise infiltration locally.	Minor	Not significant

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12 Archaeology and Cultural Heritage

12.1 Introduction

- 12.1.1 This Chapter considers the effects of the Proposed Development on the Cultural Heritage resource. Cultural Heritage includes all aspects of the historic environment, primarily buried archaeological remains and archaeological earthworks, as well as standing historic buildings and areas of historic landscape, referred to as 'historic assets'.
- 12.1.2 This Chapter sets out the methodology and legislative background for the assessment and presents the baseline conditions within the Site and surrounding area. Known and potential cultural heritage receptors are identified, and their significance clearly articulated. The nature and extent of any anticipated impacts upon the significance of those receptors is then determined, suitable mitigation measures are defined, where possible, and any residual impacts are described. Finally, a clear statement is made as to whether or not identified impacts would be considered 'significant'.
- 12.1.3 This Chapter has been informed by Appendix 12.1 (Historic Environment Desk-Based Assessment).

12.2 Policy Context

Designations and Planning Policy

- 12.2.1 The assessment has been written within the following legislative, planning policy and guidance context:
- Ancient Monuments and Archaeological Areas Act (1979)
 - Planning (Listed Buildings and Conservation Areas) Act (1990)
 - Historic Environment (Wales) Act 2016
 - Technical Advice Note (TAN) 24: The Historic Environment
 - Planning Policy Wales (Edition 11, February 2021)
- 12.2.2 Further advice has been published by Cadw, including:
- Conservation Principles (2011)
 - Setting of Historic Assets in Wales (2017)
 - Heritage Impact Assessment in Wales (2017)

Local Planning Policy

- 12.2.3 The Site is in Neath Port Talbot County Borough Council (NPTCBC). The current Local Development Plan (LDP) for NPTC, 'Local Development Plan (2011-2026)', was adopted in January 2016. The relevant policies relating to the historic environment are:
- Strategic Policy SP2: Built Environment and Historic Heritage
 - Policy BE1: Design
 - Policy BE 2: Buildings of Local Importance
 - Policy BE 3: The Canal Network

12.2.4 The policies discussed above can be seen in more detail in Appendix 12.1.

12.3 Methodology

Study Area

- 12.3.1 To characterise the known and potential historic resource within the Site environs, a study area measuring 1km around the Site's boundary was agreed with consultees. This was considered sufficient to capture the relevant data and provide the necessary context.
- 12.3.2 A Scoping Report response was provided by Cadw with regards to designated historic assets. The response confirmed that an ASIDOHL 2 (Assessment of the Significance of Development on Historic Landscapes) on Margam Mountain was not required, but the potential impact of the Proposed Development on the historic landscape would still need to be considered.
- 12.3.3 Cadw advised that assets within 5km of the Site boundary would need to be considered. As such, a 5km study area was used to identify any designated historic assets potentially susceptible to indirect impact, i.e., as a result of change to setting. Consideration was also given to potentially susceptible historic assets beyond this, to ensure the robustness of the assessment.
- 12.3.4 An indicative corridor for an electrical connection is shown in Figure 4.14. Subject to further detail of the route being defined, which will be prepared for a separate planning application, at this stage there are several known heritage assets in the corridor, but they do not necessarily preclude a feasible route being identified.

Data Sources

12.3.5 The data sources consulted were as follows:

- Cadw – information relating to designated historic assets, e.g., World Heritage Sites, Listed Buildings, Scheduled Monuments, and Registered Parks and Gardens;
- GGAT HER – database of known archaeological sites, findspots, historic buildings and previous archaeological works; and published and unpublished documentary sources;
- the National Monuments Record Wales (NMRW), held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), for any additional archival data about sites, buildings and monuments, accessed via the Historic Wales website;
- Natural Resources Wales (NRW) library of open access LiDAR data (DSM and DTM), accessed via the Lle: A Geo-Portal for Wales website;
- Aerial photography – vertical and oblique aerial photography ranging in date from the 1940s to present obtained from the Central Register of Aerial Photography for Wales (Welsh Government);
- Historic cartographic sources – obtained from National Library of Wales and National Library of Scotland;
- British Geological Survey (BGS) – Geological mapping (bedrock and superficial deposits) and borehole data within the Application Site and study area; and
- Archives – a search of archival material pertaining to the Application Site from Glamorgan Archives/West Glamorgan Archives.

Zone of Theoretical Visibility

- 12.3.6 The assessment was informed by a 'bare earth' Zone of Theoretical Visibility (ZTV) produced by the Applicant's Landscape and Visual Impact Assessment (LVIA) team. The bare earth ZTV models the extent of the visibility of the Application Site based upon the existing topography

alone. It does not take into account any above-ground features, including existing vegetation and built form. Neither does it take into account the influence of any proposed screening.

Site Inspection

- 12.3.7 A Site inspection was undertaken in October 2022 to assess the site within its wider landscape context, identify any evidence for previous disturbance, examine any known or suspected historic assets, and to conduct a settings assessment in relation to nearby designated and non-designated historic assets.

Impact Assessment Methodology

- 12.3.8 For the purposes of Environmental Impact Assessment (EIA), cultural heritage impacts are often expressed with reference to a matrix. Impact assessment is a subjective process, however, and the use of a matrix-led approach is no longer preferred by industry practitioners. As a reductive and quantifying process, the use of matrices fails to capture the nuances pertaining to the core concepts of 'significance' and 'harm', which are complex, inherently subjective, and at the heart of Welsh policy. This report therefore moves away from the use of matrices and instead adopts a qualitative approach, better aligned with Welsh policy and guidance, and better able to articulate those core concepts.

Significance

- 12.3.9 The assessment of 'significance' has been guided primarily by the policies and guidance contained in Cadw's 'Conservation Principles' (2011). This states that the "[...] significance of an historic asset embraces all of the cultural heritage values that people associate with it, or which prompt them to respond to it. These values tend to grow in strength and complexity over time, as understanding deepens and people's perceptions evolve." The values identified in Conservation Principles comprise:

- Evidential value: derives from those elements of historic assets that can provide evidence about past human activity, including its physical remains or historic fabric;
- Historical value: derives from aspects of past ways of life, or association with notable families, persons, events, or movements – it embodies the connection between past events and society with the present;
- Aesthetic value: derives from the sensory and intellectual stimulation drawn from an historic asset. It may include its physical form, and how it lies within its setting. It may also be the result of design, or an unplanned outcome of a process of events; and
- Communal value: derives from the meanings that an historic asset has for the people who relate to it, or for whom it figures in their collective experience or memory. It may be commemorative or symbolic and relate to issues of identity or collective memory.

- 12.3.10 These values should not be seen as prescriptive, but rather as a guide for understanding the significance of a historic asset. For example, a historic asset may also be considered to retain 'group' value deriving from its spatial, historical and/or visual inter-relationships with other associated historic assets.

- 12.3.11 For purposes of this Chapter, significance is categorised as defined in Table 12.1.

Table 12.1 Categories of Significance

Significance	Criteria
Designated historic assets of universal / international significance	World Heritage Sites of 'Outstanding Universal Value' inscribed on the World Heritage List by UNESCO's World Heritage Committee, on the basis of their cultural value, the significance of which transcends national boundaries and is of importance to humanity, both present and future generations. ¹ This may also include historic assets on the Tentative List of sites progressing towards WHS status.
Designated historic assets of high significance, often referred to as being of 'national importance'	While no formal distinction is drawn, the wording of Welsh legislation, policy and associated guidance distinguishes the following as being of particular significance: Scheduled Monuments, Grade I and II* Listed Buildings, Registered Historic Landscapes, Grade I and II* Registered Parks and Gardens, some Inventoried Historic Battlefields ² and some Conservation Areas, as well as any non-designated historic assets of equivalent significance.
	While no formal distinction is drawn, the wording of Welsh legislation, policy and associated guidance distinguishes the following as being generally of lesser (though still high) significance: Grade II Listed Buildings, Grade II Registered Parks and Gardens, some Inventoried Historic Battlefields and some Conservation Areas, as well as any non-designated historic assets of equivalent significance.
Non-designated historic assets of 'special local interest'	Historic assets that are not designated, but which make an important contribution to local distinctiveness and public knowledge, as identified by the relevant local planning authority.
Non-designated historic assets of no 'special local interest'	Historic assets that are not designated, and not of special local interest, but which are recorded in the HER / NMRW or have been identified during the EIA baseline assessment.

Magnitude

12.3.12 Magnitude of effect refers to the anticipated degree of change to the existing baseline environment during and/or following the construction of the Proposed Development. With reference to paragraph 12.3.1 of this Chapter, descriptions of the magnitude of any identified impacts upon historic assets are qualitative, with the nature and extent of those impacts fully described.

Impact

12.3.13 Cadw's Impact Assessment guidance provides that heritage impact assessment needs to demonstrate how development would 'sustain or enhance the significance of [a] historic asset, including potential benefits and any harm'. Impact is therefore discussed in these terms within this chapter. The levels of impact referred to are categorised in Table 12.2.

¹ There are currently four such sites in Wales: The Castles and Town Walls of Edward I at Caernarfon, Conwy, Beaumaris and Harlech in Northwest Wales; The Slate Landscape of Northwest Wales; Blaenavon Industrial Landscape in Southeast Wales; and Pontcysyllte Aqueduct and Canal in Northeast Wales.

² There are over 700 Historic Battlefields in Wales. The Inventory of Historic Battlefields is a non-statutory Inventory, which means that there is no primary legislation enacted to protect entire battlefields. However, parts of battlefields may be designated as scheduled monuments or listed buildings, and some battlefields may lie within areas of land registered as historic parks and gardens.

Table 12.2 Categories of Impact

Level of Impact	Criteria
Major Beneficial	Development would result in a considerable enhancement to the significance of a designated historic asset, or to that of a non-designated historic asset of demonstrably equivalent significance.
Minor Beneficial	Development would result in a modest enhancement to the significance of a designated historic asset, a non-designated heritage asset of equivalent significance, or a non-designated heritage asset of special local interest.
Neutral	Development would sustain the significance of a designated or non-designated historic asset.
Minor Adverse	Development would result in a modest level of harm to the significance of a designated historic asset, or a non-designated historic asset of equivalent significance, such that the asset's significance would be largely sustained; or would result in harm to the significance of: - a non-designated historic asset of special local interest; or - any other non-designated historic asset of higher significance, i.e., with the potential to make a material contribution to regional research objectives, which could be off-set by a programme of industry standard mitigation.
Major Adverse	Development would result in a high level of harm to, or loss of, the significance of a designated historic asset, or a non-designated historic asset of demonstrably equivalent significance; or would result in the loss of significance of: - a non-designated historic asset of special local interest; or - any other non-designated historic asset of higher significance, i.e., with the potential to make a material contribution to regional research objectives, which cannot be off-set by a programme of industry standard mitigation.

12.3.14 All possible impacts resulting from the Proposed Development have been considered, including those that are temporary or permanent, and those that would occur during the construction, operation, and decommissioning phases of the development.

Cumulative Impact

12.3.15 Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. This Chapter has considered both direct and indirect cumulative impacts.

12.3.16 No cumulative impacts have been identified in this Chapter (see Section 12.10 below).

Mitigation

12.3.17 Mitigation in heritage terms may entail variations in design, to reduce or remove a potential harmful effect. Where mitigation by design is not possible or desirable, for instance where a variation to a scheme may render it non-viable, or where the scale of necessary mitigation outweighs the perceived significance of the receptor, then preservation by record may be used to off-set the harm. Preservation by record might include a scheme of archaeological excavation to document the nature, extent, and significance of a historic asset prior to any change or loss. Any such record would be deposited with a suitable local or national archive for posterity.

Residual Impact

12.3.18 Where any potential impacts to the heritage resource are identified within this Chapter, mitigation measures are proposed to prevent, minimise, or offset any resultant harm. Any residual impacts, i.e., such as would persist even after mitigation, are identified.

Significance of Effect

12.3.19 Where an impact has been identified, a clear statement has been made as to whether that impact is considered 'Significant' or 'Not Significant', consistent with the requirements of the Environmental Impact Assessment Regulations 2017. In reaching this conclusion, professional judgment has been used, with reference to the criteria provided within Tables 12.1 and 12.2, and with full justification provided.

Assumptions and Limitations

12.3.20 The conclusions drawn in this assessment are based on the baseline conditions (presented below), which are derived in large part from the data held and supplied by the HER and NMRW. In establishing the baseline conditions, both the accuracy and currency of the data supplied has necessarily been assumed.

Consultation

12.3.21 The Historic Environment Desk-Based Assessment that informs this Chapter, and which is included as Appendix 12.1, was undertaken in accordance with a Written Scheme of Investigation (WSI), formalising the adopted scope and methodology. The WSI was submitted to the Planning Officer at Glamorgan-Gwent Archaeological Trust (GGAT) for review, comment, and approval prior to the assessment being undertaken.

12.4 Baseline conditions

Current Baseline

12.4.1 The identified historic assets are listed in a gazetteer (Appendix 1 and 2 of Appendix 12.1) and their locations are illustrated in accompanying figures (Figures 3, 5, 13, and 14 of Appendix 12.1).

12.4.2 There are two designated historic assets within the Site; Cwm Pelenna Colliery Ventilation Furnace, Scheduled Monument (GM458) and Cwm Pelenna Ventilation Stack, Grade II Listed Building (22888). There are no other designated heritage assets within the Site. Within the wider 5km Study Area there is one Registered Historic Landscape, two Conservation Areas, two Registered Historic Park and Gardens, 28 Scheduled Monuments, and 143 Listed Buildings.

12.4.3 A detailed discussion on the baseline of the Site is included in Section 4.4 of Appendix 12.1. Therefore, this will not be repeated here, instead a summary of each historic period is discussed below.

Prehistoric Period

12.4.4 There is no evidence for settlement or any other substantive prehistoric occupation within the Site. It is likely that the surrounding landscape was an area in which prehistoric communities existed; however, the upland location of the Site was likely to have belonged to a funerary landscape and in an area where transhumance movements was common.

Roman Period

12.4.5 There is no evidence for Roman settlement within the Site or the immediate surrounding area. There are two Scheduled Monuments to the north and north-west of the Site which comprise of Roman marching camps (GM258 and GM367), these were temporary camps that were used by the Roman military while moving through the landscape. The nearest known Roman

settlement is the Roman fort and associated vicus near Neath, located over 5.5km to the west of the Site. As such, there is a limited potential for unrecorded remains of this period to survive buried within the Site.

Early Medieval Period

- 12.4.6 There is no evidence for settlement or any other substantive early medieval occupation within the Site. As such, there is limited potential for unrecorded remains of this period to survive buried within the Site. If remains from the early medieval period are encountered within the Site boundary then they would likely comprise of agricultural features, e.g., enclosures and boundaries.

Medieval Period

- 12.4.7 Medieval remains are present within the Site. These comprise of two non-designated historic assets in the form of platform sites (00694w and 00693w). Platforms are a 'classic' medieval type of site, with a rectangular platform built as a stance for a rectangular building, and such sites are found in both upland and lowland areas and are often found in agricultural contexts. The platform sites are recorded in GGAT's HER and are illustrated in the LiDAR data (Figures 6 – 10 of Appendix 12.1), but no other medieval features are apparent. Nonetheless, there is some potential of further medieval remains to be present within the Site. Such features, if present, would likely consist of further agricultural features.

Post-medieval and Modern Period

- 12.4.8 The post-medieval and modern evidence suggests that the Site predominantly continued to be used for agricultural purposes throughout these periods into the present day. There are instances of post-medieval industrial activities in the low-lying area in the eastern area of the Site, as well as small-scale quarrying pits throughout the Site. Any further remains belonging to these periods within the Site would most likely relate to agriculture or industry.

Future Baseline

- 12.4.9 In the absence of the proposal in the future, no other impacts will affect the heritage assets.
- 12.4.10 In the case of the proposed developments, post-construction, they will not have a continued affect upon the heritage assets

12.5 Inherent Design Mitigation

- 12.5.1 There are no inherent design mitigations.

12.6 Potential Effects

Construction Phase

Physical effects

- 12.6.1 The physical effects have been discussed in detail in Appendix 12.1. A summary of the findings is discussed below.
- 12.6.2 Physical effects will be restricted to within the footprint of the Proposed Development (Figure 4.1) as described in Chapter 4.

- 12.6.3 Groundworks have the potential to physically (directly) impact buried archaeological deposits. Any such impacts would be adverse, direct, permanent, and irreversible in nature, and would likely result in the partial loss of any archaeological deposits present within that specific area.
- 12.6.4 The Proposed Development could directly impact the Scheduled Monument of Cwm Pelenna Colliery Ventilation Furnace (GM458). The upgrade and widening of Fforch-Dwm Road have the potential to encroach upon the Scheduled area. If conventional road widening techniques were employed, i.e., excavation, then there would be a Major to Moderate Adverse Effect upon Cwm Pelenna Colliery Ventilation Furnace (GM458).
- 12.6.5 However, to mitigate any possible effects on the Cwm Pelenna Colliery Ventilation Furnace Scheduled Monument (GM458), the section of Fforch-Dwm Road which bisects the monument would not be the subject of conventional widening works. Instead, it is proposed that a 'floating road' is installed at this location. This would avoid any physical effects upon a monument of national significance. The road would be widened by conventional means within the areas beyond the Scheduled area, but the c. 10m of the road which abuts the Scheduled Monument would remain undisturbed. This would avoid direct and physical impacts upon archaeological significance of the Scheduled Monument.
- 12.6.6 A detailed Scheduled Monument Consent (SMC) Heritage Impact Assessment (HIA) is to be prepared and submitted with the planning application. Such documents will lay out the designs of the road, how they would affect the Scheduled Monument, and what will be done to ensure its significance is protected and retained.
- 12.6.7 The construction of access tracks for the Proposed Development could also directly impact the non-designated medieval platform site (00693w), situated within the western area of the Site. If the access tracks were to impact the platform site, there could be a Minor to Moderate Adverse Effect upon it. However, the platform site has been severely eroded over the centuries and it is difficult to see at ground level. As such, it is recommended that archaeological mitigation is undertaken to record and monitor any ground works associated with the construction of an access track in this area.
- 12.6.8 The Fforch Dwm Uchaf Row (00862w) and Railway (02435.0w) are both non-designated post-medieval historic assets, which in plan would be truncated by the proposals. However, as outlined in detail in the Historic Environment Desk-Based Assessment (Appendix 12.1) the assets were removed in the 20th century and the areas were cleared and levelled. As such, there will be no effect upon these historic assets.

Non-physical effects

- 12.6.9 The potential non-physical (setting) effects upon designated historic assets within 5km of the Site were assessed in line with Cadw's 'Setting of Historic Assets in Wales' (see Section 6 of Appendix 12.1).
- 12.6.10 It was determined that the Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888) could be impacted by the Proposed Development. These impacts would result from the likelihood of increased traffic and activity due to the construction phase of the Proposed Development; however, the harm would likely be minimal, and it would not detract from their overall appreciation. As such, there could be a Minor to Moderate Adverse Effect upon Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888) as a result of changes to their setting.
- 12.6.11 There will be no significant effects upon any other designated historic asset.

Operational Phase

12.6.12 During the operational phase, no further physical impacts are expected on the archaeological resource.

12.6.13 It was also determined that the Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888) could be impacted by the operational phase of the Proposed Development. These impacts would be from the continued traffic on the nearby access tracks during the lifespan of the Proposed Development. Although, as above, these impacts are likely to be minimal, and it would not detract from their overall appreciation. As such, there could be a Minor to Moderate Adverse Effect upon Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888) as a result of changes to their setting.

12.6.14 No further significant effects will occur to the significance of historic assets due to changes within their setting.

Decommissioning

12.6.15 When the Proposed Development is decommissioned, it is expected that all surface aspects of the Site will be removed and reinstated. This includes areas of hardstanding, e.g., wind turbine foundations. Site access tracks could remain in situ if required by the landowners or be reinstated. The substation/control building, and equipment will be removed and the land reinstated.

12.6.16 This work will take place in parts of the Site already disturbed during construction. A carefully controlled programme of demolition and reinstatement should not lead to any further impacts on historic assets already affected by the construction works. Therefore, no significant impacts will occur as a result of decommissioning.

12.6.17 No other known archaeological remains will be physically affected by the proposals. There is, however, the potential of encountering previously unrecorded archaeological remains within the Site. All further archaeological work should be agreed with the Archaeological Planning Officer at GGAT via a Written Scheme of Investigation.

12.7 Residual effects

12.7.1 If a road widening scheme is implemented that avoids any physical impact upon the Scheduled area of Cwm Pelenna Colliery Ventilation Furnace (GM458), as discussed above, then there will be no direct significant effect upon the historic asset.

12.7.2 The construction of access tracks also has the potential of directly impacting the non-designated medieval platform site (00693w). This is poorly preserved and is not a historic asset of the highest significance. It has been recommended that that archaeological mitigation is undertaken to record and monitor any ground works associated with the construction of an access track in this area. If the asset is impacted then this will weigh as a Minor to Moderate Adverse Effect. Therefore, the impact is considered to be Not Significant in EIA terms.

12.7.3 The non-physical effects of the Proposed Development upon Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888) would remain as a Minor to Moderate Adverse Effect. Therefore, the impact is considered to be Not Significant in EIA terms.

12.8 Implications of Climate Change

- 12.8.1 The impact of climate change on the predicted effects of the historic environment has been considered, utilising the UKCP18 climate change projections. There will be no further impacts arising as a result of climate change.

12.9 Cumulative effects

- 12.9.1 Regarding the likely significant cumulative effects on heritage assets, the assessment considers operational, consented, submitted applications, EIA screening, and scoping requests for wind farm developments within the surrounding area of the Proposed Development, i.e., used to identify any designated historic assets potentially susceptible to indirect impact. These developments are shown in Table 12.3 below.

Table 12.3 Cumulative Developments

ES Fig. 3.1 ref.	Name	Description
1	Pen y Cymoedd	Operational – 76 wind turbines
2	Fynnon Oer	Operational – 16 wind turbines
3 / 4	Lynfi Afan	Operational – 12 wind turbines
5	Mynydd Brombil	Operational – 4 wind turbines
6	Maesgwyn Extension	Operational – 4 wind turbines
30b	Melin Court	Consented – 5 wind turbines
31	Y Bryn	Pre-application - 18 wind turbines
46	Upper Ogmere	Consented – 7 turbines
51	ABP Margam Sands – 4-year turbine test	Operational / consented – 2 wind turbines
83	Mynydd Drumau Solar Farm	Pre-application – no. turbines unknown

- 12.9.2 As indicated above, most of the historic assets assessed would not be significantly impacted as a result of the Proposed Development. It is considered that there could be a Minor to Moderate Adverse Effect upon Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888), but this relates changes to their immediate setting.

- 12.9.3 There would be no significant effects upon any other historic assets, and as such any cumulative effects are unlikely to be significant. Thus, while cumulative effects have been considered, detailed discussion is not required.

12.10 Summary

- 12.10.1 This Chapter assesses the potential for significant effects on historic assets resulting from the construction and operation of the Proposed Development. This Chapter also identifies measures that should be taken to mitigate predicted adverse effects.

- 12.10.2 The Proposed Development could directly impact the Scheduled Monument of Cwm Pelenna Colliery Ventilation Furnace (GM458). To mitigate this, it is recommended that a 'floating road' scheme is devised. This would avoid direct and physical significant effects upon a Scheduled Monument.

- 12.10.3 The Proposed Development could also directly impact the poorly preserved non-designated medieval platform site (00693w), situated within the western area of the Site. To mitigate this, it is recommended that archaeological mitigation is undertaken to record and monitor any ground works associated with the construction of an access track in this area. Any impact to the historic asset will be considered Minor to Moderate Adverse Effect and Not Significant in EIA terms.

12.10.4 No other known archaeological remains will be physically affected by the proposals. There is, however, the potential of encountering previously unrecorded archaeological remains within the Site. Therefore, an archaeological watching brief could be undertaken during groundworks associated with the Proposed Development. Such archaeological work could be secured by way of a planning condition.

12.10.5 Additionally, the likelihood of increased traffic and activity during both the construction and operational phases of the Proposed Development could cause a Minor to Moderate Adverse Effect upon Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888). These effects are therefore Not Significant.

12.10.6 A summary of the assessment is set out in Table 12.4 overleaf.

12.11 References

Cadw 2011, Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment in Wales

Cadw 2017, Setting of Historic Assets in Wales

Chartered Institute for Archaeologists 2020, Standard and Guidance for Historic Environment Desk-Based Assessment

Welsh Government 2017, Technical Advice Note 24: The Historic Environment (TAN 24)

Welsh Government 2021, Planning Policy Wales (PPW), Edition 11

Table 12.4 Summary of effects

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Construction Phase					
Cwm Pelenna Colliery Ventilation Furnace (GM458)	Direct impacts as a result of road widening scheme	Major to Moderate Adverse Effect	A 'floating road' scheme to be designed that would not involve any direct impacts to the Scheduled Monument	None - with mitigation implemented	Not significant
Cwm Pelenna Colliery Ventilation Furnace (GM458)	Non-physical effects - change of assets setting	Minor to Moderate Adverse Effect			Not significant
Cwm Pelenna Ventilation Stack (22888)	Non-physical effects - change of assets setting	Minor to Moderate Adverse Effect			Not Significant
Non-designated medieval platform site (00693w)	Direct impacts as a result of construction of access tracks	Minor to Moderate Adverse Effect	Monitor and record during ground works	None - with mitigation implemented	Not significant
Operation Phase					
Cwm Pelenna Colliery Ventilation Furnace (GM458)	Non-physical effects - change of assets setting	Minor to Moderate Adverse Effect			Not significant
Cwm Pelenna Ventilation Stack (22888)	Non-physical effects - change of assets setting	Minor to Moderate Adverse Effect			Not significant

13 Transport and Access

13.1 Introduction

13.1.1 This chapter considers the likely significant effects on transport and access associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the existing access network and transport baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and any potential cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

13.1.2 The Transport and Access assessment was undertaken by Pell Frischmann. The technical reviewer of the traffic and transport assessment is Gordon Buchan BEng (Hons), MSc, CMILT, FCIHT, Divisional Director of Pell Frischmann. He has over 25 years of undertaking the transport assessments associated with new developments 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, Transport Planner. She has over six years of experience in the transport planning industry.

13.1.3 This chapter is supported by the following figures and appendices:

- Figure 13.1 Study Area;
- Figure 13.2 Traffic Count Locations;
- Figure 13.3 Accident Locations;
- Figure 13.4 AIL and Construction Traffic Delivery Routes;
- Appendix 13.1 Transport Assessment;
- Appendix 13.2 Transport Management Plan Report;
- Appendix 13.3 Abnormal Indivisible Load Route Survey.

13.2 Policy Context

13.2.1 This assessment is carried out in accordance with the principles contained within the following documents:

- Future Wales - The National Plan 2040 (2021);
- The Wales Transport Strategy (2021);
- Planning Policy Wales Edition 11 (2020)
- Technical Advice Note 18 Transport (2007);
- Welsh Transport Appraisal Guidance (2017);
- Neath Port Talbot County Borough Council (NPTCBC) Local Development Plan (2016);
- Rhondda Cynon Taf Local Development Plan (2006 - 2021);

- Rhondda Cynon Taf Supplementary Planning Guidance: Delivering Design and Placemaking: Access, Circulation & Parking Requirements (March 2011); and
- South East Wales Valleys Local Transport Plan (2015).

13.2.2 An overview of the above policy and guidance documents is provided in Appendix 13.1, Transport Assessment.

13.3 Assessment methodology

Study Area

- 13.3.1 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 footpaths, byways and bridleways 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.
- 13.3.2 Access for construction materials is from the south-west, via the A465 and Neath. Abnormal loads associated with the wind turbines will be delivered from the proposed Port of Entry (PoE) Swansea to the site via the M4, A465 and via the A474, B4434 and the B4287.
- 13.3.3 The study area is therefore defined by the following road links which are shown in Figure 13.1:
- Fforch-dwm Road between the eastern site access and junction with Ton-Mawr Road;
 - Ton-Mawr Road between Fforch-dwm Road and the junction with B4287;
 - The B4287, between junction with Ton-Mawr Road and B4287 / B4434 / Greenway Road signalised junction;
 - The B4434, between its junction with the A474 and Neath Abbey Road;
 - The A474, between Neath Abbey Road and the B4434 Roundabout;
 - The A465 between the M4 and the Aberdulais Interchange; and
 - The A4107, between its junction with B4287 and its junction with the M4.
- 13.3.4 The Proposed Development will be directly accessed from two new access junctions. The west access is taken from taken from Ton-Mawr Road and the east from Fforch-dwm Road. The layout of the new access junctions are presented in Appendix 13.1.
- 13.3.5 The access junctions will be designed to accommodate all predicted loads and traffic for both the construction and operational phases of the Proposed Development.

Desk Based Research and Data Source

- 13.3.6 The following data sources have informed the assessment:
- assumed construction programme;
 - accident data – crashmap.co.uk;
 - traffic data –Department for Transport (DfT) Road Traffic Statistics;
 - sensitive locations within the study area – www.google.co.uk/maps;
 - any other traffic sensitive receptors in the area (cycle paths, routes, communities, etc.) – www.google.co.uk/maps 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

13.3.7 The following field surveys were carried out to inform the assessment:

- A site visit was undertaken to review the potential access routes and potential constraints; and
- Automatic Traffic Counts (ATC) surveys to measure traffic flows and speeds within the study area were undertaken in November 2021. The ATC locations are shown on Figure 13.2.

Predicting effects

Sensitivity

13.3.8 Sensitivity has been determined on the basis of the 'Guidelines for Environmental Impact Assessment' (2005) which notes that the separate 'Guideline for the Environmental Assessment for Road Traffic' (1993) document should be used to characterise the environmental traffic and transport effects (off-site effects) and the assessment of significance of major new developments. The guidelines intend to complement professional judgement and the experience of trained assessors.

13.3.9 In terms of traffic and transport effects, the receptors are the users of the roads within the study area and the users and residents of locations through which those roads pass.

13.3.10 The IEMA Guidelines includes 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 13.1.

Table 13.1 Value/sensitivity Assessment

Receptor value / sensitivity	Receptor type
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.
Negligible	Where roads have no adjacent settlements. Includes new or existing strategic trunk roads that would be little affected by additional traffic

Receptor value / sensitivity	Receptor type
	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.

13.3.11 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

13.3.12 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%). and
- Rule 2: include any other specifically sensitive areas where total traffic flows are predicted to increase by 10% or more.

13.3.13 The IEMA Guidelines identify the key impacts that are most important when assessing the magnitude of traffic effects from an individual development.

- Severance – the IEMA Guidelines states that, “severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery.” Further, “Changes in traffic of 30 %, 60 % and 90 % are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ [or minor, moderate and major] changes in severance respectively”. However, the Guidelines acknowledge that “the measurement and prediction of severance is extremely difficult”. (Para 4.28).
- Driver delay – the IEMA Guidelines note that these delays are only likely to be “significant [or major] when the traffic on the network surrounding the proposed development is already at, or close to, the capacity of the system.” (Para 4.32).
- Pedestrian delay – the delay to pedestrians, as with driver delay, is likely only to be major when the traffic on the network surrounding the Proposed Development is already at, or close to, the capacity of the system. An increase in total traffic of approximately 30 % can double the delay experienced by pedestrians attempting to cross the road and would be considered ‘major’.
- Pedestrian amenity – the IEMA Guidelines suggests that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its lorry component) is halved or doubled (Para 4.39). It is therefore considered that a change in the traffic flow of -50 % or +100 % would produce a ‘major’ change in pedestrian amenity.
- 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 ‘major’ changes respectively.
- Accidents and safety – professional judgement has been used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

13.3.14 While not specifically identified, as more vulnerable road users, cyclists are considered in similar terms to pedestrians.

13.3.15 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 based on Table 3.4N of DMRB LA104 – Environmental Assessment and Monitoring. This is presented in Table 13.2.

Table 13.2 Magnitude of Impact

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.
Negligible	No effects or those that are imperceptible.

Level of effect

13.3.16 To determine the level 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 Design Manual for Roads and Bridges (DMRB) and summarised in Table 13.3.

Table 13.3 Level of effect

Receptor Sensitivity	Magnitude of Impact			
High	Major	Major	Moderate	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

13.3.17 The level of the predicted effect 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 approach to EIA (Chapter 3) and require consideration of whether negative effects can be avoided, or if not, mitigation can be identified to reduce the level of effect.

13.3.18 Where an effect could be moderate/minor, 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.

Consultation

13.3.19 Consultation with relevant stakeholders is summarised below in Table 13.4.

Table 13.4 Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issues Raised	Response / Action Taken
Planning & Environment Decisions Wales (PEDW) 24/06/2022	EIA Scoping Direction	PEDW is supportive of the approach set out in the SR. The applicant should continue to liaise with the relevant Local Authorities and with the Transport Directorate of the Welsh Government.	Noted
Neath Port Talbot County Borough Council 30/05/2022	EIA Scoping Direction	The proposed methodology is considered acceptable	Noted
		The methods used for obtaining traffic flows are considered to be acceptable	Noted and undertaken
		The use of Low National Road Traffic Forecasts (NRTF) is considered to be acceptable	Noted and undertaken
		Committed development assumptions should include the Foel Trawsant development and Outline Planning Permission for a P2018/0493 for an adventure holiday resort including up to 600 lodges, 100 bed hotel and facilities. Located at Land at Pen Y Bryn, Croeserw, Cymmer.	Noted and included as committed developments
		Network upgrades. Two potential schemes are likely to be undertaken: 1. At TA Centre Eastland Rd / Cimla Rd. A traffic enhancement scheme is proposed, subject to funding. 2. Between B4287 Efail fach and Tonmwar Rd Tonmwar, retaining wall strengthening scheme to reconstruct the existing wall.	We understand from follow on discussion with NPTCBC that the works at the TA centre in Neath have not secured funding. The retaining wall works are noted.
		SWTRA / WG will need to advise on the trunk roads which is a substantial element of the turbine delivery route.	Noted. Both have been included in scoping.
		It is advised that NPTCBC policy for wind farms recommends that planning permission is not determined until such time as a Transport Management Plan (TMP) for the access route to the site has been agreed with the Highway Authority.	Noted. A draft TMP is included in the application documents.
		A TMP should be based on documented trial runs that mimic the movement of the longest, widest and highest anticipated loads as agreed with the Highway Authority.	Noted. As explained to NPTCBC in follow up correspondence, it is not possible to undertake a test run prior to determination due to the use of the

			blade lifting trailer and clamp trailer and that none of the mitigation works would be in place to allow access. Examples of the trailers and details on general transport have been provided to NPTCBC to illustrate the trailers use.
		Before a trial run can be scheduled, a brief Trial Traffic Management Plan (TTMP) is required to enable the police to agree the details and to decide how it will be managed.	As noted previously, a trial run is not feasible for the proposed transport systems.
		The applicant must apply for Temporary Traffic Regulation Orders (TTROs) for each section of the AIL route.	Noted. These will be applied for prior to AIL movements commencing.
		Any substantial construction works or highway alterations (temporary or permanent) required along the public highway will be subject to a Road Safety Audit. Stages 1 to 4 in accordance with HD/19/03 or the Design Manual for Roads and Bridges.	Noted. Detailed design preparation will be undertaken post determination.
Welsh Government, Network Management Division 20/05/2022	EIA Scoping Direction	We are in agreement with the scoping report. I attach our standard windfarm condition for the information of the applicant. In terms of the development site, this includes the whole component transportation route. We are therefore interested in a CTMP that includes port/point of entry and exit to the road network as well as travelling weights and dimensions.	Noted. There were a number of errors in the proposed condition wording and these have been advised to the WG.
Neath Port Talbot County Borough Council 3 rd October 2022	Post Scoping Discussion	The council asked for further information on the proposed turbine delivery vehicles.	Further details of the proposed vehicles and examples from across Europe have been provided.
		Request for test run	As noted previously, a trial run is not feasible for the proposed transport systems.
		Concern was raised about the standard of repair of Eastlands Road.	A Wear & Tear Agreement on road condition can be agreed to ensure that the road does not deteriorate further as a result of the proposed construction traffic movements.

Assumption and Limitations

13.3.20 The assessment is based upon average traffic flows in one-month periods. During the month, activities at the proposed development may fluctuate between one day and another and it is not possible to fully develop a day-by-day traffic flow estimate as no contractor has been appointed and external factors can impact upon activities on a day by day basis (weather conditions, availability of materials, time of year, etc).

13.4 Baseline conditions

Current Baseline

Active Travel

13.4.1 There are a number of footpaths, byways and bridleways which are located within the site boundary. These are illustrated in Appendix 13.1.

13.4.2 A review of the Sustrans NCN map (<https://www.sustrans.org.uk/national-cycle-network>) indicates there are no National Cycle Routes (NCRs) on the National Cycle Network (NCN) in the vicinity of the Proposed Development.

Vehicle Access

13.4.3 Consultation with NPTCBC was undertaken to agree the likely scope of the TA in the form of the request for a Scoping Direction. This consultation centred around data collection count sites, likely points of origin for materials to assist in developing a suitable study network.

13.4.4 Access for construction materials are assumed to be from the south-west, via the A465 and Neath. Abnormal loads associated with the wind turbines will be delivered from the proposed Port of Entry (PoE) Swansea to the site via the M4, A465 and via the A474, B4434, B4287, Ton-Mawr Road and Fforch-dwm Road.

13.4.5 The study area is therefore defined by the following road links which are shown in Figure 13.1.

- Fforch-dwm Road between the eastern site access and junction with Ton-Mawr Road;
- Ton-Mawr Road between Fforch-dwm Road and the junction with B4287;
- The B4287, between junction with Ton-Mawr Road and B4287 / B4434 / Greenway Road signalised junction;
- The B4434, between its junction with the A474 and Neath Abbey Road;
- The A474, between Neath Abbey Road and the B4434 Roundabout;
- The A465 between the M4 and the Aberdulais Interchange; and
- The A4107, between its junction with B4287 and its junction with the M4.

13.4.6 In order to assess the impact on the study area, a series of Automatic Traffic Count (ATC) sites were established between 24 and 30 November 2021. The ATC count sites were as follows:

- Fforch-dwm Road, approximately 125 m to the east of Fforch-dwm Road / Ton-Mawr Road junction; and
- Ton-Mawr Road, approximately 160 m to the north-east of B4287 / Ton-Mawr Road.

13.4.7 In addition to the ATC data, further traffic count data was obtained from the Department for Transport (DfT) database for the following locations:

- B4287, east of Cimla Community Centre (DfT Count Point 811738);
- A465, west of Neath Abbey Interchange (DfT 30534);
- A4107, approximately 1.15 km south of junction with B4287 (DfT 78497); and
- A4107, north of Gwar-Y Caeau (DfT 30655).

13.4.8 The locations of the ATC and DfT sites are illustrated in Figure 13.2. These sites were identified as being areas where sensitive receptors on the access route will be located.

13.4.9 The traffic counters allowed the traffic flows to be split into vehicle classes and the data have been summarised into cars / light goods vehicles (LGVs or LGVs) and heavy goods vehicles (HGVs) (buses and all goods vehicles >3.5 tonnes gross maximum weight). Table 13.5 summarises the 2022 baseline traffic flows.

Table 13.5 Baseline 24-hour Average Traffic Data (2022)

Ref. No	Count Location	Cars & LGV	HGV	Total
1	Fforch-dwm Road	104	23	127
2	Ton-Mawr Road	1,476	227	1,703
3	B4287, east of Cimla Community Centre	8,564	109	8,674
4	A465, west of Neath Abbey Interchange	42,827	2,094	44,921
5	A4107, approximately 1.15 km south of junction with B4287 (DfT 78497)	4,094	66	4,161
6	A4107, north of Gwar-Y Caeau	5,970	111	6,081

Please note minor variances due to rounding may occur.

13.4.10 The ATC sites used to provide traffic volume data were also used to collect speed statistics. The speed survey data indicates that there are issues with speeding along Ton-Mawr Road. This indicates that traffic management will be required at this location and that South Wales Police may wish to consider enforcement spot checks in this area.

13.4.11 Comments by some members of the public were noted at the consultation events on the accuracy of the ATC traffic data. Following these events, new ATC surveys were undertaken, however the counter equipment was damaged on two separate occasions and as such it has not been possible to include this data in the updated report.

Accident Review

13.4.12 Road traffic accident data for the period commencing 01 January 2019 through to the 31 December 2021 was obtained for the B4287 and AIL delivery route within the study area from the online resource crashmap.co.uk which uses data collected by the police about road traffic crashes occurring on British roads.

13.4.13 The statistics are categorised into three categories, namely “Slight” for damage only incidents, “Serious” for injury accidents and “Fatal” for accidents that result in a death.

13.4.14 A summary analysis of the incidents indicates that:

- A total of 25 accidents were recorded within the review area, of which 22 were classified as slight, one was classified as serious and two fatalities were recorded;

- One accident which was classified as fatal occurred along the B4287, Tyn-y-Waun near the southbound bus stop which is shown on Google Maps. The accident involved two cars and resulted in three casualties.
- One accident which was classified as fatal occurred on the A465, to the east of the Neath Abbey Industrial Estate Access. The accident involved a pedestrian and a car and resulted in one fatality.
- A total of five motorcycles were involved in accidents within the review area, of which five were classified as slight.
- HGVs were involved in a total of three accidents of which two accidents were classified as slight and one was classified as serious.
- Two accidents involved cyclists which were both classified as slight. One accident was recorded to only involve bicycles, while the other incident also involved a car.
- One accident involved a pedestrian which, as noted above, resulted in a fatality.
- Within the survey period a total of four accidents were recorded at the mini roundabout at B4287 / Westernmoor Road / Beechwood Avenue, which were all classified as slight. Two of these incident involved motorcycles.
- Three accidents were recorded at the A474 / Windsor Road / Alford Road roundabout, which were all classified as slight. All three incidents involved cars and two involved motorcycles and one involved a bicycle.
- A total of six incidents were recorded at the Neath Abbey Interchange, which were all classified as slight. All six incidents involved cars, while one also involved a motorcycle.

13.4.15 The locations of the reported incidents are provided in Figure 13.3.

Future Baseline

13.4.16 It is anticipated that construction of the Proposed Development will commence in 2025, if consent is granted. It is expected that construction of the project will take up to 12 months, depending on weather conditions.

13.4.17 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.

13.4.18 A review of surrounding planning applications has been undertaken to determine committed developments, i.e. those that have been granted planning consent and that are of significance with regards to traffic generation.

13.4.19 A review of the NPTCBC planning portal has been undertaken. Applications that require a Transport Assessment or are similar renewable projects are considered significant. NPTCBC has requested that the assessments consider two developments, namely:

- P2018/0493: Adventure Holiday Park located to the south east of the development site. A copy of the Transport Assessment was obtained and by converting the peak hour flows noted in the report, it was noted that daily trips through Traffic Survey Point 5 would be 1,020 two way flows and 480 two way flows through Survey Point 6; and
- P2014/0825: Foel Trawsnant Wind Farm located to the south. A total of 164 two way construction flows are predicted for this scheme and would only pass through Traffic Survey Point 6.

13.4.20 The traffic flows from these committed developments will be included in the future baseline traffic data for the A4107.

13.4.21 The review noted that within the study area road network, that there were no other planning applications that were either significant traffic generators or developments with planning consent.

13.4.22 There are a number of renewable and energy projects located close to the proposed development, including Melin Court Wind Farm, Y Bryn Wind Farm and Upper Ogmere Wind Farm. These projects are either not consented (and therefore cannot be considered as committed development) or they do not use the same road links to achieve access to their respective access junctions.

13.4.23 The future baseline traffic flows (including the committed development flows) are estimated by applying a National Road Traffic Forecast (NRTF) low growth factor. The resulting flows are summarised in Table 13.6.

Table 13.6 Future Baseline 24-hour Average Traffic Data (2025)

Ref. No	Count Location	Cars & LGV	HGV	Total
	Fforch-dwm Road	106	23	129
2	Ton-Mawr Road	1,500	231	1,730
3	B4287, east of Cimla Community Centre	8,701	111	8,812
4	A465, west of Neath Abbey Interchange	43,512	2,128	45,640
5	A4107, approximately 1.15 km south of junction with B4287 (DfT 78497)	5,180	67	5,247
6	A4107, north of Gwar-Y Caeau	6,546	273	6,818

Please note minor variances due to rounding may occur.

Sensitive Receptors

13.4.24 A review of sensitive receptors has been undertaken within the study area. Table 13.7 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 13.7.

Table 13.7 Receptor Sensitivity Summary

Receptor	Sensitivity	Justification
Users of Fforch-dwm Road	High	Where the road is a minor rural road, not constructed to accommodate frequent use by HGV
Residents on Fforch-Dwm Road	Low	Where a location is a small rural settlement, few community or public facilities or services.
Users of Ton-Mawr Road	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.
Residents of Tonmawr and Efail-fach	Medium	Where a location is an intermediate sized rural settlement, containing some community or public facilities and services.
Users of the B4287	Medium	Where the road is a local A or B class road, capable of regular use by HGV traffic. Includes roads where

Receptor	Sensitivity	Justification
		there is some traffic calming or traffic management measures.
Residents of Cimla	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.
Users of the A465	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.
Users of the A4107	Medium	Where the road is a local A or B class road. Includes roads where there is some traffic calming or traffic management measures.
Residents of Pontrhydyfen	Medium	Where the road is a local A or B class road. Includes roads where there is some traffic calming or traffic management measures.
Residents on the A4107	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.
PRoW / Bridleway Users	High	Minor path used by walkers and cyclists, not constructed to accommodate HGV traffic flows.

13.5 Inherent Design Mitigation

13.5.1 The access strategy for construction traffic has, wherever possible, tried to avoid access through inappropriate access links and communities. The access strategy to the Mynydd Blaenafon section of the site has avoided Johns Terrace and access through the Tonmawr RFC access junction and track.

13.6 Potential Effects

13.6.1 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.

Construction Phase

13.6.2 The assessment is based upon the construction effects that may occur within the study area during the 12 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.

13.6.3 During the assumed 12 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 ready-mix concrete and some aggregate materials;
- AIL consisting of the wind turbine components and heavy lift crane(s); and
- escort vehicles for AIL deliveries.

13.6.4 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 on low loaders.

13.6.5 The turbines will be delivered in component sections for ease of transport and will be assembled at the Site. The nacelle, hub, drive train, blade, tower sections are classified as AIL due to their weight and/or length, width and height when loaded.

13.6.6 The components can be delivered on a variety of transport platforms with typical examples illustrated in Appendix 13.1.

13.6.7 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 to site. Boom and ballast trucks will also require access 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.

13.6.8 The resulting traffic generation profile is included in Appendix 13.1. The assessment is based upon an assumed construction programme for the Proposed Development, lasting 12 months. Alterations in this programme, may increase or decrease traffic flows per month.

13.6.9 The peak of construction occurs in Month 5 with 162 movements per day (24 Car / Lights and 138 HGV journeys).

13.6.10 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 will use Ton-Mawr Road, with traffic for the Mynydd Fforch-dwm portion of the site accessing via Fforch-dwm Road. Traffic for the Mynydd Blaenafon section of the site will access the site from Ton-Mawr Road;
- Aggregate / bulk materials and ready-mix concrete will be delivered to the Site from the south via the M4, A465 and B4287;
- Staff working at the Site are likely to be based locally. It is assumed that the majority will be based in Neath, with a small proportion based in either Swansea or Port Talbot;
- AIL traffic will access the site using the routes described in Figure 13.4; and
- General site deliveries will arrive via the M4, A465 and B4287. These are generally smaller rigid HGV vehicles.

13.6.11 To estimate the total trips through the study area during the peak of the construction phase, the traffic generation was calculated and distributed through the network (based on traffic distribution assumptions) and combined with the 2025 baseline traffic data. The resulting figures were compared with the 2025 baseline traffic to provide a percentage change in movements at each count location within the study area, as shown in Table 13.8.

Table 13.8 2025 Future Baseline + Construction Traffic

Ref. No	Count Location	Cars & LGV	HGV	Total	% Car / LGV Increase	% HGV Increase	% Total Traffic Increase
	Fforch-dwm Road	114	74	187	7.57%	214.96%	45.13%
	Ton-Mawr Road	1,524	369	1,892	1.60%	59.84%	9.36%
3	B4287, east of Cimla Community Centre	8,723	249	8,972	0.25%	124.61%	1.82%
4	A465, west of Neath Abbey Interchange	43,514	2,266	45,780	0.00%	6.49%	0.31%
5	A4107, approximately 1.15 km south of junction with B4287 (DfT 78497)	5,182	67	5,249	0.05%	0.00%	0.05%
6	A4107, north of Gwar-Y Caeau	6,548	273	6,820	0.03%	0.00%	0.03%

Please note minor variances due to rounding may occur.

13.6.12 The total traffic movements are not predicted to increase by more than 46% on all of the study network. Within close proximity of the site access junctions (Fforch-dwm Road and Ton-Mawr Road), the increase in traffic levels is the highest. Whilst the increase in traffic flows are statistically significant, they are generally caused by the relatively low flows on these two road links, which will see an additional 164 journeys (82 inbound trips and 82 outbound trips). This represents approximately nine additional inbound journeys every hour during peak construction activities.

13.6.13 It should also be noted the construction phase is transitory in nature and the peak of construction activities is short-lived. After Month 5, traffic flows significantly reduce to between 45 and 48 journeys per day (24 inbound and 24 outbound trips).

13.6.14 A review of existing road capacity has been undertaken. The theoretical road capacity has been estimated for each of the road links for a 24-hour period that makes up the study area. None of the links experiences capacity issues as illustrated in Appendix 13.1.

13.6.15 In accordance with the IEMA Guidelines Rules 1 and 2, detailed assessments have been undertaken on the following receptors:

- Users of Fforch-dwm Road;
- Residents on Fforch-Dwm Road;
- Users of Ton-Mawr Road;
- Residents of Tonmawr and Efail-fach; and
- Users of the PRow / Bridleways.

13.6.16 The significance of the potential effects on the above receptors has been determined using the rules and thresholds previously outlined in the Assessment of Significance section. Table 13.9 summarises the significance on the receptors for the construction phase prior to mitigation measures being applied.

Table 13.9 Potential Construction Phase Effects Summary

Receptors	Severance	Driver Delay	Pedestrian Delay	Amenity	Fear	Accidents & Safety
Users of Fforch-dwm Road	Major	Minor	Major	Major	Major	Moderate
Residents of Fforch-dwm Road	Minor	Minor	Moderate	Minor	Minor	Minor
Users of Ton-Mawr Road	Moderate	Minor	Moderate	Minor	Moderate	Moderate
Residents of Ton-Mawr & Efail-fach	Minor	Minor	Minor	Minor	Minor	Minor
PRoW Users	Major	Negligible	Moderate	Major	Moderate	Moderate

13.6.17 The effects in **bold** are considered significant, prior to the application of mitigation measures. Proposals for mitigation are required and the effects reassessed.

13.6.18 It is worth considering that the effects relate solely to the peak of construction activities (Month 5), and that the construction period is short lived and the effects transitory in nature.

Operational Phase

13.6.19 There are no significant operational phase effects as traffic volumes associated with the operational phase are very low, circa two inbound trips per fortnight. As such. No operational phase assessment is required.

13.7 Additional Mitigation

Construction Phase

Construction Traffic Management Plan

13.7.1 The following measures will be implemented through a Construction Traffic Management Plan (CTMP) during the construction phase. The CTMP will be agreed with NPTCBC and SWTRA prior to construction works commencing:

- Agree AIL route modifications and improvements with NPTCBC and SWTRA and other relevant stakeholders. Details of the proposed mitigation measures are presented in the Transport Management Plan report provided;
- Where possible the detailed design process will minimise the volume of material to be imported to the Proposed Development to help reduce HGV numbers. This includes an investigation to determine if onsite concrete batching can be undertaken to reduce traffic numbers;
- A site worker Staff Travel Plan, including transport modes to and from the worksite (including pick up and drop off times);
- 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 entrances, depending the views of NPTCBC;
- 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 wind turbine erection may take place outside these hours. No work is proposed on Sundays and public holidays unless otherwise agreed with the Council;
- 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 for all construction vehicles through Neath, Cymla and the section from Efail-fach through to each site access junction; and
- 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.

13.7.2 NPTCBC may require an agreement to cover the cost of abnormal wear and tear on the road network leading from the A465 to site.

13.7.3 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 state of the road prior to any construction work commencing. This baseline will inform any change in the road condition during the construction stage of the Proposed Development. Any necessary repairs will be coordinated with the relevant authorities. 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.

13.7.4 Any damage to road infrastructure caused directly by construction traffic will be made good, and street furniture that is removed on a temporary basis will be fully reinstated.

13.7.5 There will be a regular road edge review and any debris and mud will be removed from the public road 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.

Transport Management Plan

13.7.6 There are a number of traffic management measures that could help reduce the effect of abnormal load convoys. A framework Transport Management Plan (TMP) for abnormal loads accompanies the application in Appendix 13.2.

13.7.7 A police escort will be required to facilitate the delivery of the predicted loads. The police escort will be further supplemented by a civilian pilot car to assist with the escort duty. It is proposed that an advance escort will warn oncoming vehicles ahead of the convoy, with one escort staying with the convoy at all times. The escorts and convoy will remain in radio contact at all times where possible.

13.7.8 The abnormal loads convoys will be no more than three AILs long, or as advised by the police, to permit safe transit along the delivery route and to allow limited overtaking opportunities for following traffic where it is safe to do so.

13.7.9 The times in which the convoys will travel will need to be agreed with South Wales Police who have sole discretion on when loads can be moved.

A Staff Travel Plan

13.7.10 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

13.7.11 Information on the wind turbine convoys will be provided to local media outlets such as local papers and local radio to help assist the public.

13.7.12 Information will relate to expected vehicle movements from the port of entry through to the main site entrance. This will assist residents becoming aware of the convoy movements and may help reduce any potential conflicts.

13.7.13 The applicant will also ensure information was distributed through its communication team via the project website, local newsletters and social media.

Onsite Measures via a Path Management Plan (PMP)

13.7.14 Consideration will be given to pedestrians and cyclists alike due to potential interactions between construction traffic and users of the PRow network. These measures will be formulated into a Path Management Plan.

13.7.15 The Principal Contractor will ensure that speed limits are always adhered to by their drivers and associated subcontractors. This is particularly important within close proximity 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.

13.7.16 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 and cyclists in the area. This will also be emphasised in weekly toolbox talks.

13.7.17 Users of the PRowS will be separated from construction traffic through the use of 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 Traffic Signs Manual Chapter 8 compliant temporary road signage would be provided to assist at these crossings for the benefit of all users.

13.7.18 The British Horse Society recommendations on the interactions between HGV traffic and horses states 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.

13.7.19 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.

13.7.20 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 in order 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.

13.7.21 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 tool box talks to specific equestrian issues.

Operational Phase

13.7.22 No specific operational phase mitigation is required. Access tracks will be well maintained and monitored during the operational life of the development. Regular maintenance will be undertaken to keep the access track drainage systems fully operation and to ensure there are no run-off issues onto the public road network.

13.8 Residual effects

Construction Phase

13.8.1 The identification of residual construction effects considers the assessment of traffic impacts following the incorporation of the identified 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 and is provided in Table 13.10.

Operational Phase

13.8.2 There are no operational phase effects.

13.9 Implications of Climate Change

13.9.1 The UK Climate Projections (UKCP18) show a general trend towards warmer, wetter winters and 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.

- 13.9.2 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.

13.10 Cumulative effects

- 13.10.1 The use of NRTF low growth assumptions has provided a basis for general local development growth within the study area.

- 13.10.2 In line with the agreed approach in the transport section of the scoping report, only committed developments (i.e. those with planning approval) have been included in the cumulative assessment in line with good practice for transport planning projects. These committed schemes have been included in the future baseline traffic flows. As such, there is no further cumulative assessment required.

13.11 Summary

- 13.11.1 Existing traffic data established a base point for determining the impact during the construction phase and was factored to future levels to help determine the effect of construction traffic on the local road network.
- 13.11.2 The construction traffic will result in a temporary increase in traffic flows on the road network surrounding the Proposed Development. The maximum traffic effect associated with construction of the Proposed Development is predicted to occur in Month 5 of the construction programme. During this month, an average of 138 HGV movements is predicted per day and it is estimated that there will be a further 24 car and light van movements per day to transport construction workers to and from the Site.
- 13.11.3 A series of mitigation measures and management plans have been proposed to help mitigate and offset the impacts of the construction phase traffic flows.
- 13.11.4 No link capacity issues are expected on any of the roads assessed due to the additional movements associated with the Proposed Development. The effects of construction traffic are temporary in nature and are transitory
- 13.11.5 A summary of the assessment is set out in Table 13.10 overleaf.

Table 13.10 Summary of effects

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
Construction Phase					
Receptor					
Users of Fforch-dwm Road	Severance	Significant	CTMP Measures including improved signage, reducing movements (through Staff Travel Plan and onsite batching) and speed limits / driver training.	Minor	Not significant and short term
	Pedestrian Delay	Significant	CTMP Measures including driver training, speed limits in sensitive areas and public information.	Minor	Not significant and short term
	Amenity	Significant	CTMP measures including signage and speed limits	Minor	Not significant and short term
	Fear	Significant	CTMP measures including signage and speed limits	Minor	Not significant and short term
	Accidents & Safety	Significant	CTMP measures including signage and speed limits	Minor	Not significant and short term
Residents of Fforch-dwm Road	Pedestrian Delay	Significant	CTMP Measures including driver training, speed limits in sensitive areas and public information.	Minor	Not significant and short term
Users of Ton-Mawr Road	Severance	Significant	CTMP Measures including improved signage, reducing movements (through Staff Travel Plan and onsite batching) and speed limits / driver training.	Minor	Not significant and short term
	Pedestrian Delay	Significant	CTMP Measures including driver training, speed limits in	Minor	Not significant and short term

Receptor	Description of potential impact	Significance prior to mitigation	Proposed mitigation	Residual effect	Significant / not significant
			sensitive areas and public information.		
	Fear	Significant	CTMP measures including signage and speed limits	Minor	Not significant and short term
	Accidents & Safety	Significant	CTMP measures including signage and speed limits	Minor	Not significant and short term
PRoW Users	Severance	Significant	Path Management Plan and wider CTMP Measures	Minor	Not significant and short term
	Pedestrian Delay	Significant	Path Management Plan and wider CTMP Measures	Minor	Not significant and short term
	Amenity	Significant	Path Management Plan and wider CTMP Measures	Minor	Not significant and short term
	Fear	Significant	Path Management Plan and wider CTMP Measures	Minor	Not significant and short term
	Accidents & Safety	Significant	Path Management Plan and wider CTMP Measures	Minor	Not significant and short term
Operation Phase					
Receptor	N/A	N/A	N/A	N/A	N/A

14 Socio-Economic

14.1 Introduction

- 14.1.1 This chapter assesses the potential social and economic impacts of developing the Mynydd Fforch Dwm Wind Farm. The assessment will encompass the whole lifecycle of the wind farm, from design and planning (development) to construction, operation, and eventual decommissioning.
- 14.1.2 Economic impacts will be quantitatively considered through two core indicators: the number of jobs safeguarded or created, and the overall contribution to the Gross Value Added (GVA). Qualitative economic impacts such as skills development will also be considered to complement quantitative analysis. In addition, social impacts will be reviewed including an assessment of potential tourism and recreation impacts alongside a review of mitigation measures taken to reduce any negative consequences.
- 14.1.3 The location of the site is wholly located in the administrative area of Neath Port Talbot, covered by Neath Port Talbot County Borough Council. The proposed site boundary is located approximately 1 km to the north-east of the village of Tonmawr, which together with Pontrhydyfen 1 km to the south of Tonmawr constitutes the electoral ward of Pelenna.
- 14.1.4 For the purposes of this socio-economic impact assessment, the proposed development of six (6) wind turbines, two with tip heights of 180m and the rest with a tip height of 200m (base to tip) with an assumed output of up to 35MW, and ~10 hectares of solar PV panels in the south west section of the proposed site is assumed.
- 14.1.5 The following sections detail the methodology followed, a review of the baseline conditions in the defined study area, and the results of the assessment.

14.2 Policy Context

- 14.2.1 In the UK, there are currently over 8,800¹ onshore turbines, hosted at just over 2,600 operational onshore wind farm sites². These range from sites of a single turbine (for example the community-owned turbine at Graig Fatha near Coedely in Rhondda Cynon Taff)³ to Pen y Cymoedd at the administrative boundary between Neath Port Talbot and Rhondda Cynon Taf, with 76 turbines in operation, and onshore wind farms in Scotland with several hundred turbines (Clyde I, II & extensions). In total, the onshore wind industry represents 5,500 jobs in the UK, of which 600 are in Wales⁴. In total the wind sector generated ~£6 billion in turnover in 2019⁵, of which £3.6 billion was estimated to come from onshore, increasing from £3 billion in 2014 when GVA for the sector was estimated at £906 million⁶.

1 UK Wind Energy Database, RenewableUK, accessed 20/10/2022

2 Ibid.

3 Graig Fatha Community Wind, Ripple Energy, 2022

4 Low Carbon and Renewable Energy Economy Estimates, ONS, 2019

5 Wind Energy in the UK: June 2021, ONS

6 Low Carbon and Renewable Energy Economy Estimates, ONS, 2019

- 14.2.2 In the Welsh Government's most recent Net Zero Wales Carbon Budget⁷ there is a commitment to use the full range of levers available to Welsh Ministers to reduce carbon emissions by an average of 37% by 2025. This includes continuing to consent to the construction of further onshore wind developments. The Welsh Government's 2022 Annual Report⁸ emphasises their continued commitment to reducing the use of coal, oil and gas for energy production while shifting towards increased generation from renewable sources such as tidal, solar, offshore, and onshore energy generation.
- 14.2.3 The UK government has made a commitment to reach net zero by 2050⁹, and renewable energy, including wind power, is fundamental to achieving this. This priority is reaffirmed in the more recently published Electricity Networks Strategic Framework¹⁰, which emphasises the need for the quick delivery of strategic onshore grid investments. Welsh Government is also committed to sustainable development and net zero with a pledge campaign across the country to reduce carbon emissions.¹¹ The Wales Environment Act of 2016¹² establishes clear targets for greenhouse gas emissions to reach net zero by 2050. Further, in 2017 the Welsh Government set out sustainability targets in a Plenary Statement on Energy Policy to commit to of 70% of energy consumption from renewable sources and 1GW of local ownership by 2030; both targets that the Mynydd Fforch Dwm Wind Farm will contribute to achieving. The legislation also reaffirms the general principles by which Natural Resources Wales should work, namely that the principle of sustainable management should be applied to natural resources in Wales. This principle is reflected in Natural Resources Wales' State of Natural Resources Report¹³, in which the need for sustainable energy sources and a transition away from fossil fuels is highlighted. Furthermore, in January 2023, the Government consulted on proposals for revised energy targets for Wales to meet the equivalent of 100% of annual electricity consumption from renewable electricity by 2035¹⁴.
- 14.2.4 Future Wales - The National Plan to 2040¹⁵ highlights that Wales is well placed to generate renewable energy given its natural assets and is considered an integral part of the Welsh Government's strategy to reaching decarbonisation targets and reducing the impact of the climate emergency. In addition to the 70% of electricity consumption to be generated by renewable energy by 2030, it also stipulates that one gigawatt of renewable energy capacity should be owned locally by 2030, and already by 2020 new renewable energy projects should have at least an element of local ownership.
- 14.2.5 The Wellbeing of Future Generations Act (2015) has underpinned the work of the Welsh Government since its passing. The Mynydd Fforch Dwm development aligns with three of the legislation's well-being goals: prosperity, resilience, and global responsibility by contributing towards a low carbon economy and making use of natural resources in a sustainable manner. The wider social and economic benefits of the development have the potential to cover all seven wellbeing goals set out in the Act.

7 Net Zero Wales: Carbon Budget 2 (2021-2025), Welsh Government, 2021

8 Welsh Government Annual Report 2022, Welsh Government, 2022

9 Net Zero Strategy: Build back greener, UK Government, 2021

10 Energy Network Strategic Framework: Enabling a secure, net zero energy system, BEIS and Ofgem, 2022

11 Working together to reach net zero: All Wales Plan 2021-25, Welsh Government, October 2021

12 Environment (Wales) Act 2016, Welsh Government, 2016

13 The Second State of Natural Resources Report, Natural Resources Wales, 2020

14 <https://www.gov.wales/review-wales-renewable-energy-targets>, 2023

15 Future Wales: The National Plan to 2040

- 14.2.6 Commitments to decarbonisation in Wales can also be found in Prosperity for All: The National Strategy¹⁶ as well as Capturing the Potential: A Green Jobs Strategy for Wales¹⁷. Both policy documents discuss the need to reduce Wales' reliance on fossil fuel energy by expanding the generation of renewable energy. Both documents also refer to the social benefits brought to local areas through community involvement either through shared ownership or community benefit funding allowing for reinvestment in the priorities of the local community.
- 14.2.7 More locally, the construction of the Mynydd Fforch Dwm Wind Farm also aligns with objectives laid out by Neath Port Talbot Council in their Local Development Plan (LDP)¹⁸. The LDP commits to making a proportionate contribution to the national renewable energy targets by encouraging all forms of renewable energy where appropriate. The LDP in particular makes reference to two wind energy Strategic Search Areas identified by Welsh Government which have the future potential to be utilised as onshore wind farm sites.
- 14.2.8 Neath Port Talbot and the surrounding areas' potential for wind energy production is reiterated in the South West Wales Regional Economic Delivery Plan (2021), where the region's onshore energy capacity is described as a key asset to be exploited by the local authorities. The development also aligns with one of the investment themes listed in the Swansea Bay City Region Deal. The 'Internet of Energy' theme seeks to build on the energy asset base of the region, in particular by aligning renewable energy production with energy innovations in the region.
- 14.2.9 The Welsh Government uses planning policy in Wales as a mechanism by which to facilitate the transition to a lower carbon economy. Therefore, installations such as Mynydd Fforch Dwm are expected to fit within the policy environment and environmental goals of the Welsh Government.
- 14.2.10 In order to meet the planning policy requirements and ensure the Mynydd Fforch Dwm opportunity is maximised, robust information has been gathered to support this economic impact assessment chapter.

14.3 Assessment methodology

- 14.3.1 Wavehill have completed this socio-economic impact assessment for the Mynydd Fforch Dwm Wind Farm proposal based on experience as a leading economic and social research organisation in Wales, with a strong track record of supporting economic regeneration and development in rural areas. Wavehill have provided economic impact assessments for several other wind farms in Wales, both pre and post build as well as assessment of community benefit funds for Pen Y Cymoedd Wind Farm. Other wind farms Wavehill have supported on include an economic assessment for Pen March Wind Farm, socio-economic impact assessment for Garn Fach Wind Farm, and an extensive Local Multiplier 3 assessment of the Clocaenog Forest Wind Farm.
- 14.3.2 In addition, Wavehill are supporting several other EIAs for other renewable energy proposals across Wales, including the Meillion Solar Farm, and an evaluation of the Morlais Consenting and Development programme for an offshore tidal cluster. Welsh Government have also previously commissioned Wavehill to undertake a mapping exercise of the Clean Technology and Renewable Energy sector in Wales. This knowledge, experience, and extensive portfolio

16 Prosperity for All: The National Strategy, Welsh Government, 2017

17 Capturing the Potential: A Green Jobs Strategy for Wales, Welsh Government, 2009

18 Local Development Plan (2011-2026), Neath Port Talbot CBC, 2016

of projects delivered within the renewable energy sector in Wales will inform findings for a socio-economic assessment of Mynydd Fforch Dwm Wind Farm so ensure it is robust and considers all aspects.

- 14.3.3 As a starting point to the assessment, extensive desk based analysis has been conducted to draw qualitative and quantitative data from a range of sources which has then been synthesised to provide evidence for estimates of the socio-economic impacts of wind farms. Further a review of the policy context has been undertaken to situate the proposal in the latest economic strategy environment alongside a review of the socio-economic baseline in the local area.
- 14.3.4 The comparators and benchmarks established from the literature material, as well as the social and economic baseline conditions surrounding the site inform the assumptions on which modelling is based. Where relevant, recognised metrics have been used to capture impacts, such as ONS data to convert spend into GVA and the number of jobs created or safeguarded specific to the wind industry and renewable energy sector.
- 14.3.5 Economic impacts for Mynydd Fforch Dwm Wind Farm are estimated using an econometric model which is built on the literature evidence and experience of other projects combined with insight from the economic baseline. The modelled estimates of economic impact for Mynydd Fforch Dwm Wind Farm are set out in the table below. These are broken down into the development, construction, and operations and maintenance phases. The below demonstrates how the local area and national economy will be impacted in each phase. These are presented for the 35 year expected lifespan of the wind farm, and these will be the indicators against which the socio-economic impact of Mynydd Fforch Dwm Wind Farm is assessed.

Table 14.1 Socio-economic Indicators

Indicator	Description	Evidence
Gross Value Added (GVA)	The amount of output generated through the economy as a direct and indirect consequence of the development and operation of the Mynydd Fforch Dwm Wind Farm. Assessment will be made based on expenditure and revenue generated by the investment and supply chain impact. It will also assess the impact on the sectors in which this expenditure will take place, and typical output to turnover ratios these sectors typically command.	ONS data Welsh input-output tables Literature review
Employment	Estimated job years to be created and safeguarded as a direct and indirect consequence of the development of the Mynydd Fforch Dwm Wind Farm, based on findings from comparable projects and conversions made from expenditure based on turnover to employment ratios and multiplier effects.	ONS data Welsh input-output tables Literature review
Social Impacts	Qualitative judgements based on the likely effects to be felt by the community through provision of local services during the build phase, impacts and effects of the anticipated community benefit fund providing investment for a range of activities and initiatives.	Literature review Comparison with other projects
Tourism and Recreation Impacts	The effect of the construction and operation of the wind farm on tourism will be considered, including disruption to amenities at the site or impact on enjoyment from use or change in visitor patterns for the area.	Literature review Comparison with other projects

- 14.3.6 The effect on tourism and recreation are also considered as part of the socio-economic impact assessment, and will be based on the potential disruption to existing uses of the site and adjacent areas. Data available on tourism and visitor numbers to Neath Port Talbot as well as literature available to evidence public perceptions of wind farm developments will be used to support these considerations.

Predicting effects

- 14.3.7 There is no published standard for assessing the significance of impacts of the development on different receptor groups, although in general, it follows that the established principles that proximity to the receptor, the levels of usage and the ease of mitigation determine sensitivity. Receptors include the economy within the Local Study area (encompassing the local supply chain, labour market, and GVA), and the impact on tourism and the tourism economy within the wider area of Neath Port Talbot.
- 14.3.8 The predicted level of effect is based upon consideration of both the sensitivity of the reception and the magnitude of impact. However, in this instance as the two aforementioned socio-economic impacts considered within the ES are assumed to have an equal level of sensitivity (e.g. one job is considered the same as another, companies in the sector are equally vulnerable to changes in the local supply chain), then magnitude alone will be considered when determining the significance of an impact. These will be based on the criteria set out in Table 14.2 below.

Table 14.2 Magnitude of impacts

Magnitude	Description
High	A substantial change to socio-economic loss or gain in the area of impact affecting a large number of people (100+) and/or businesses (30+) to the extent of changing the business and employment structure.
Medium	A partial change to socio-economic loss or gain in the area of impact affecting a sizeable number of people (20-100) and/or businesses (10-30) to the extent of adjusting business operations and employment.
Low	A small change to socio-economic loss or gain in the area of impact affecting a group of people (<20) and/or businesses (<10) to the extent of influencing business activities and employment opportunities.
Negligible	No change to socio-economic loss or gain in the area of impact affecting no people and/or businesses permanently and very few people (<10) and/or businesses (<5) temporarily (for less than 1 year).

- 14.3.9 The model outcomes will be compared with the economic baseline for the area and the criteria in Table 14.2 and classified as either beneficial or adverse against the defined magnitude.

Area of Study

14.3.10 The socio-economic impacts of Mynydd Fforch Dwm Wind Farm are determined at three levels. The first is a local study area which has been established based on the wards that fall within 10km of the proposed site. This is illustrated in the local area of impact in the map below (Figure 14.1). Given this geography is fairly consistent with the Neath Port Talbot local authority, and economic baseline information is available for the local authority, the Neath Port Talbot boundary will be treated as the local level impact. Where relevant, specific impact on small geographies or businesses may be identified where there is a risk of a direct implication of the wind farm on the receptors in question.

14.3.11 The second level is at the Wales national level and the third for the whole of the UK). This method will support alignment of available socio-economic data with the baselines established in the section below. It will also reflect the added economic value the proposed development will bring in terms of benefits for the local and Welsh economy including jobs created, increased GVA for businesses based outside the immediate location of the site and outside of Neath Port Talbot, and supply chains with a reach beyond Wales.

Figure 14.1 Map of study area



14.3.12 The two settlements closest to the site, Tonmawr and Ponthydyfen, constitute part of the electoral ward of Cimla and Pelenna, two wards which were merged into one Unitary Authority

electoral division following a 2020 boundary review. Most of Cimla and Pelenna is made up of woodlands and farmlands¹⁹. The area was once surrounded by active coalmines, such as Cwm Blaenpelenna which has since been naturally regenerated and is a designated Site of Importance for Nature Conservation (SINC) and forms part of The Waun SINC. There is a historical chapel and tunnel at Gylfylchi, and Parsons Folly. At Tonmawr there is a Minewater Treatment Plant SINC which contains scrubland and lowland heath. Tonmawr also has a rugby club, a community centre, business units, places of worship, and two Cadw-listed monuments of heritage significance.

- 14.3.13 Sensitivity will be taken to allow for leakage of benefits outside Wales and the UK, in specific regard to the location of contractors, such as wind farm technicians on travelling contracts (i.e. not based in the local area or even necessarily Wales but travelling to different sites for a fixed period of time during the construction phase or during annual maintenance cycles), and supply chains (for instance where turbine towers, blades, hubs, nacelles, gearboxes and other major components are likely to be sourced and supplied from outside the UK).

Assumption and Limitations

- 14.3.14 It is assumed that all data referenced in this assessment, for example from Office of National Statistics (ONS), StatsWales, and NOMIS, is up-to-date as of the time of the assessment. For the smallest settlements and hamlets representative data at ward or LSOA level is used where no other data was available.

- 14.3.15 As there is no agreed and pre-determined guidance for assessing impacts of wind farm developments on communities and socio-economic effects, evidence has been drawn from existing literature to inform an assessment of likely effects in relation to the community and socio-economic baselines. References are used consistently in the text.

14.4 Baseline conditions

Current Baseline

- 14.4.1 This section sets out the socio-economic characteristics of the local area to the proposed Mynydd Fforch Dwm Wind Farm site. It details a number of indicators against which the area can be assessed, providing comparison figures to Wales and the UK where appropriate. This data is drawn from mainly ONS sources. As the site is based within Neath Port Talbot, data for this local authority will be recorded for the baseline.

Population

- 14.4.2 Neath Port Talbot has a total population of 142,300, having grown 1.8% since the last census in 2011²⁰. Neath Port Talbot is the 9th largest local authority in Wales by population, the biggest population centres being Neath (51,581), Port Talbot (38,134), Pontardawe (13,330), Cwmavon (5,547) and Glyn-Neath (4,195)²¹.

Earnings, employment, unemployment, and deprivation

The employment rate in Neath Port Talbot for an adult of working age (between 16 and 64) is 72.8%, which is slightly below the Welsh and UK average employment rate of 73.1% and 74.7% respectively. In terms of gender, 78.2% of males are employed and 67.8% of females

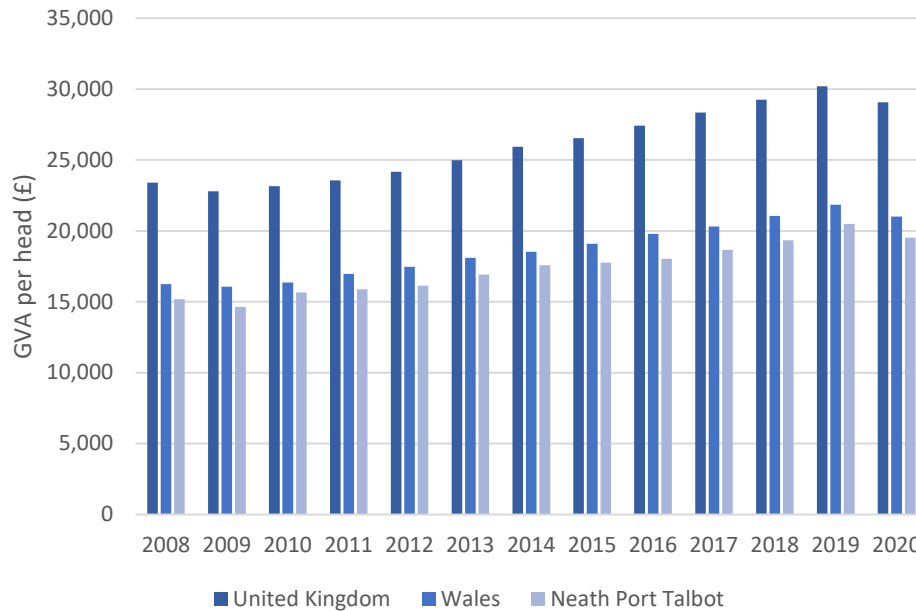
19 Cimla and Pelenna, NPT Council, 2021

20 2021 Census, ONS, 2022

21 Small Area Population Estimates, ONS, 2021

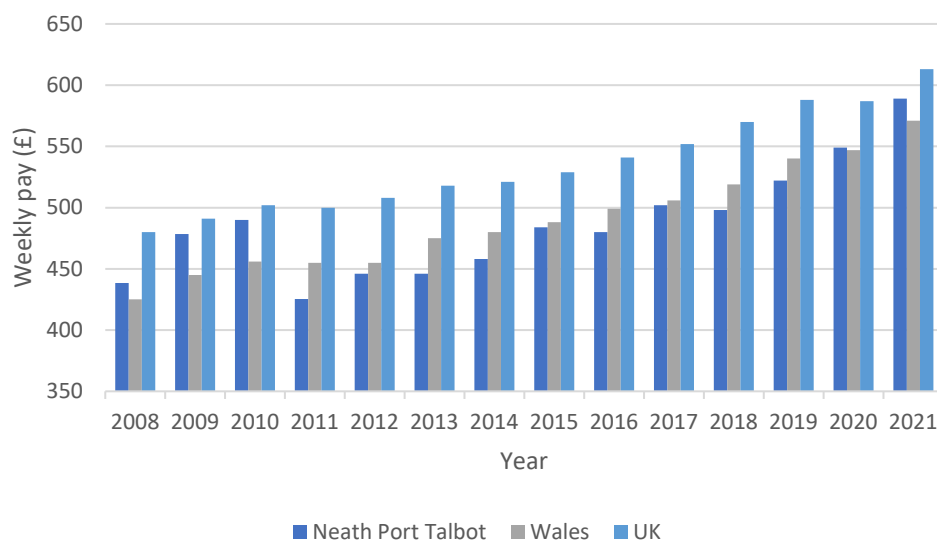
are employed, this places Neath Port Talbot's male employment rate above the Welsh male average of 76.5% and places the female employment rate below the Welsh average of 69.7%²².

Figure 14.2 GVA per head of population (UK, Wales, NPT)



14.4.3 In Neath Port Talbot, residents' gross median weekly earnings were £596.80. This is above Wales's average of £562.80²³.

Figure 14.3 Gross Weekly Pay (FT Workers)

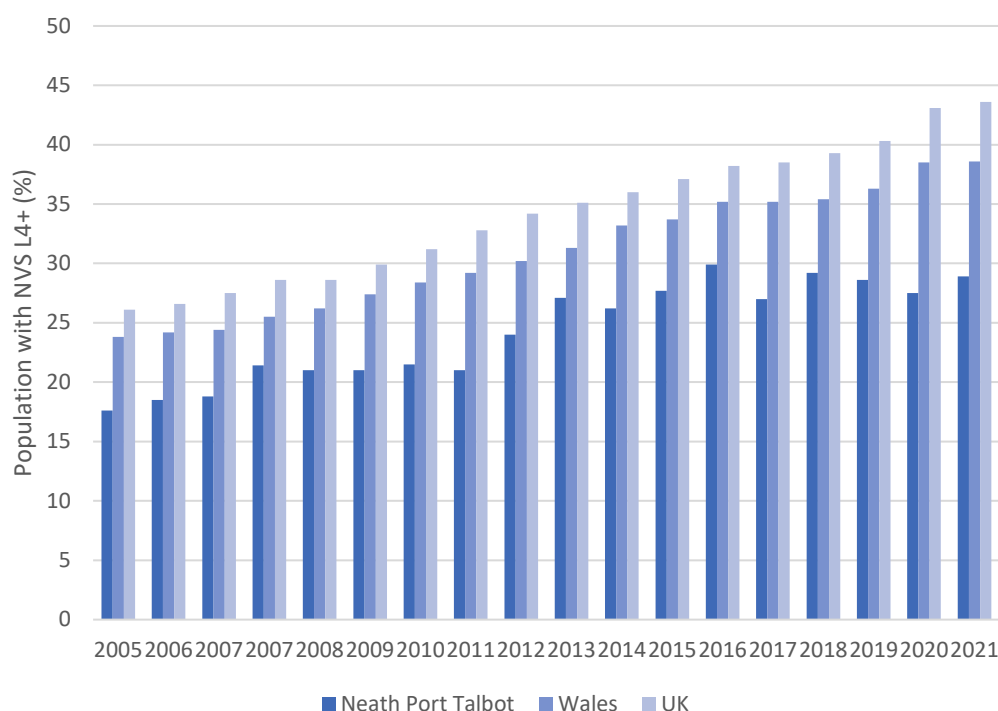


22 Annual Population Survey, ONS, 2022

23 Annual Survey of Hours and Earnings, ONS, 2021

14.4.4 Qualifications are slightly below the Welsh average in Neath Port Talbot with 68.7% of the working age population qualified to NVQ2 level qualification or above (GCSE) compared to the Welsh average of 75.3%. There is also a greater proportion of adults with no qualifications in Neath Port Talbot compared to Wales's average, which are 10.6% and 8.3% respectively. Neath Port Talbot also has a smaller proportion of people with an NVQ4 level qualification or above than the Welsh average, 28.9% compared to 38.6%²⁴.

Figure 14.4 NVQ Qualifications Level 4+



14.4.5 Of the 1,909 Lower Super Output Areas (LSOAs), 91 are situated in Neath Port Talbot. The Welsh Index of Multiple Deprivation categorises LSOAs based on an index score of deprivation indicators which shows that 14 LSOAs in Neath Port Talbot are in the 10% most deprived, and 16 LSOAs are in the 10-20% most deprived LSOAs in Wales²⁵. Across the indicators, income and health are a key factor in the deprivation in several LSOAs, the biggest factors in Neath Port Talbot are education and employment.

Industry

14.4.6 Neath Port Talbot hosts 3,110 businesses, 88.4% of which are micro (less than 9 employees), 9.3% are small (10-49 employees), 1.9% are medium (50-249) and 0.3% are large (250+ staff)²⁶. Neath Port Talbot's largest industry is Manufacturing, which employs roughly 9,000 people (18% of total jobs). The next largest industry is Human Health and Social Work Activities, which employs roughly 8,000 people (16% of total jobs). Other large industries in the local authority include Wholesale, Retail and Repair of Motor Vehicles as well as Public Administration and Defence which both employ 5,000 people each (10% of total jobs each),

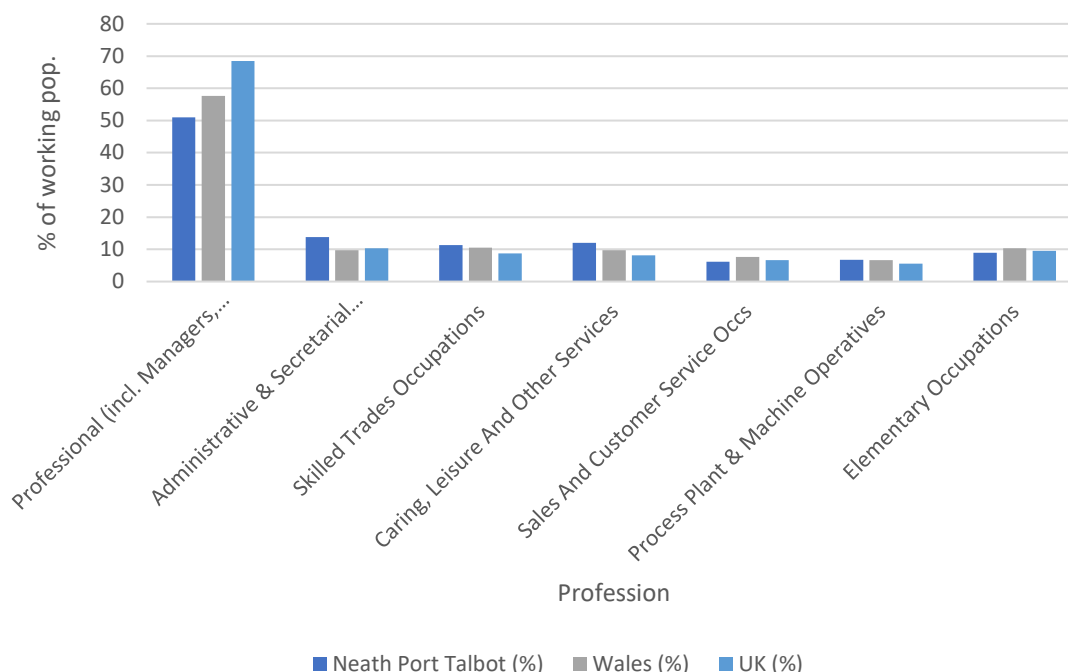
24 Annual Population Survey, ONS, 2021

25 Wales Index of Multiple Deprivation, 2019

26 Inter Departmental Business register, ONS, 2021

Education, which employs 4,500 people (9% of total jobs) and Construction, which employs 2,250 people (4.5% of jobs)²⁷.

Figure 14.5 Employment by sector (2020-2021)



Summary of Baseline Findings

- 14.4.7 The baseline review has identified the population and employment activities with the administrative boundary of Neath Port Talbot County Borough Council, as well as the structure of the local economy, job density, deprivation indicators, education and skills, and geographical characteristics of the area of study.
- 14.4.8 An increase in employment is frequently highlighted in the literature as the main benefit of wind energy developments and expanding the renewable energy sector in general. Improved access to training to develop a skilled workforce is a likely consequence of stimulating the labour market and increased demand for skilled workers. Other indicators including deprivation may be improved with shifts in earnings and employment opportunities as industry structures shift to accommodate the renewable sector.

14.5 Potential Effects

- 14.5.1 The lifecycle of a wind farm spans four phases: development, construction, operation and maintenance, and decommissioning. The socio-economic assessment will focus on all phases. The development phase will last for 3 years, the construction process will last for approximately one year and total lifecycle will be 35 years.
- 14.5.2 Employment and GVA will be generated directly by the wind farm through the lifecycle. These direct effects will in turn generate opportunities for indirect effects, particularly for local

²⁷ Business Register and Employment Survey, ONS, 2020

businesses providing services to Tier 1 contractors in the renewables sector and earnings from employed contractors on site.

Development Phase

Gross Value Added (GVA)

- 14.5.3 The development of the Mynydd Fforch Dwm Wind Farm is expected to cost £1.75m over 3 years. Evidence suggests that approximately 46% of this investment could be retained in Wales²⁸ and between 94% and 98% retained in the UK²⁹. Of the initial development cost, given historical evidence of NPT supporting local supply chains, a lower end scenario of 9% will be spent in the area local to the wind farm during the development phase. Applying these figures to Mynydd Fforch Dwm, the anticipated development expenditure suggested that in a median (97%) scenario £1.68m could be retained in the wider UK, and £805K in Wales and £158K locally.
- 14.5.4 Converting this expenditure into direct GVA using ONS ratios allows assessment of the direct impacts that the development phases of the Mynydd Fforch Dwm Wind Farm will bring.³⁰ GVA benefits would provide a total of £656K of which £304K for the wider UK, £279K for Wales and locally £73K.
- 14.5.5 Through the supply chain, initial expenditure becomes income and subsequent expenditure producing the multiplier effect of investment. Using ONS Analytical Input-Output ratios, it is also possible to convert initial development expenditure into indirect GVA. Indirect GVA benefits brought by the development phase of the Mynydd Fforch Dwm Wind Farm would provide a total of £394K, of which £287K for the wider UK, £93K for Wales and £14K for the local area.

Employment

- 14.5.6 Employment during the development phase will be mostly direct jobs with some indirect jobs. Direct jobs during development are those related to onshore wind activities, such as construction workers, technical specialists, crane operators, Health & Safety consultants, CDT and QA, and engineers³¹. Indirect jobs are jobs outside of the onshore wind energy sector but which are part of the supply chain or offer specific services to the sector. Some jobs created during development and construction (for example Site Managers, Programme Managers, planners, technical experts and surveyors) will be generated during development but continue into construction.
- 14.5.7 Based on modelling taking into account baseline data and GVA, the wider UK will see 14 direct and 7 indirect FTE job years created or safeguarded over the three year development. Of which Wales will see 7 direct and 3 indirect FTE job years created or safeguarded, and the local area 1 direct and 0.3 indirect over the three year development. This provides a total of 21 FTE in the wider UK, 9 FTE in Wales and 1.6 FTE job years for the local area.

28 Low Carbon and Renewable Energy Economy Estimates, ONS, 2019

29 Ibid.

30 Annual Business Survey, Turnover:GVA tables, ONS, 2019 & Business Register and Employment Survey, Employment by sector, ONS, 2019

31 Onshore Wind: Direct and Wider Economic Impacts, RenewableUK, 2012

Table 14.3 Jobs created and safeguarded during the development phase

Area	Direct jobs (FTE)	Indirect jobs (FTE)	Total jobs created/ safeguarded	Impact	Magnitude
Local	1	0.3	1.6	Positive	Low
Wales	7	3	9	Positive	Low
UK	14	7	21	Positive	Medium

Construction Phase

Gross Value Added (GVA)

- 14.5.8 During construction, it is expected to cost £43.75m to build the Mynydd Fforch Dwm Wind Farm over a period of 1 year, generating a substantial impact on the economy. Evidence of local suppliers used in the development of other wind farms varies with a low of 2.3% and high of 12%. Given the potential supply chain in South West Wales is limited compared to other locations from the evidence, a 5% local retention is expected during the build phase. 28% of the capital cost is anticipated to be retained in Wales, while in the wider UK the content of the construction phase is set at 46%, based on the available evidence.³² The expenditure therefore is, £20.1m total in the wider UK, £12.24m in Wales and £2.19m locally with the remaining £9.2m likely to leak out of the UK economy to overseas turbine suppliers which constitute the largest cost (70% to manufacture and install) of the construction phase.
- 14.5.9 Using ONS multipliers for Wales and the UK (local area multipliers are not contained as the supply chain is likely to stretch beyond this geography and are therefore captured in the Wales figures), this could generate an additional £5m in additional spend in the wider UK, £3.6m for Wales and £1.1m locally.
- 14.5.10 Converting this expenditure into total GVA using ONS ratios allows assessment of the direct impacts that the construction phases of the Mynydd Fforch Dwm Wind Farm will bring.³³ Total GVA benefits would be £14.9m in GVA for the wider UK, and £9.5m for Wales and £1.8m at local level.

Employment

- 14.5.11 During the construction phase, direct jobs created includes contractors and sub-contracted experts working on a specific aspect of the project for a fixed duration or fixed number of hours, as well as jobs created and safeguarded in supply chain related to the wind farm development. This could include surveyors, scientists, and consultants specialising in environmental management, landscaping, planning, community engagement, finance and tax experts, legal and property teams, procurement, engineering, management.
- 14.5.12 Based on modelling taking into account baseline data and GVA, the wider UK will see 168 direct and 75 indirect FTE job years created or safeguarded for the 12 month construction period. In Wales 102 direct and 39 indirect FTE job years will be created or safeguarded and 18.3 direct and 4.6 indirect FTE jobs will be in the local area. This provides a total of 244 FTE

³² Quantifying the benefits of onshore wind to the UK, Vivid Economics on behalf of Renewable UK, June 2019

³³ Annual Business Survey, Turnover:GVA tables, ONS, 2019 & Business Register and Employment Survey, Employment by sector, ONS, 2019

job years created or safeguarded in the wider UK, 142 FTE in Wales and 22.8 FTE in the local area.

Table 14.4 Jobs created and safeguarded during the construction phase

Area	Direct jobs (FTE)	Indirect jobs (FTE)	Total jobs created/ safeguarded	Impact	Magnitude
Local	18.3	4.6	22.8	Positive	Medium
Wales	102	39	142	Positive	High
UK	168	75	244	Positive	High

Operational Phase

Gross Value Added (GVA)

14.5.13 Estimated costs per annum for operating the Mynydd Fforch Dwm Wind Farm are £1.5m, with an expected 35 years of operation generating a total present value cost of £52.5m. Much of the operation cost is retained in the wider UK (91% average from the available evidence) with the level of local content depending on the supply chain and the location of any dedicated engineers from the operator. To allow for the South Wales supply chain and the developers operations, 10% local content is assumed. At the Wales level 64% of the operation spend is thought to be retained.

14.5.14 These proportions generate £1.32m in annual expenditure in the wider UK, £960K in Wales and £150k in the local area. This leads to a total of £807.9K in GVA, of which £189K will be generated in the wider UK, £522K in Wales and a further £96.7K in the local area annually.

14.5.15 Over the 35 year lifetime of the wind farm, there will be operational expenditure of £52.5m, of which £47.48m will be in the wider UK, £33.6m in Wales and £5.2m in the local area. Converted into GVA impacts, a lifetime total of £28.28m of GVA will be generated, of which, £6.6m GVA will be generated in the wider UK, £18.2m in Wales and a further £3.3m in the local area.

14.5.16 Indirect effects of the operation are a further £527K in GVA in the wider UK per annum and £504K in Wales producing a total GVA of £1.03m for each year of operation.

14.5.17 Over the 35 years of operation, the indirect impacts are £18.5m in GVA for the wider UK and £17.6m in Wales taking the total GVA created to £36.09m in present value.

Employment

14.5.18 During the O&M phase, there will be fewer direct jobs created than in the development and construction phase³⁴, as a proportion of the lifecycle. This is because development and construction of a wind farm is more labour intensive in terms of man hours than the day-to-day operation and scheduled maintenance cycle³⁵. Many of the jobs created during the Operational phase will be induced jobs. Induced jobs are created in response to the consumption of services (for example retail, hospitality, leisure) by those employed directly

34 Renewable Energy Benefits: Leveraging local capacity for onshore wind, IRENA, 2017

35 ibid

and indirectly at the wind farm. This type of employment is generated based on the wages paid to wind farm employees and service providers³⁶.

14.5.19 In addition, economies of scale reduce demand for labour per MW. For example, maintenance roles are likely to span multiple sites in Wales with scheduled maintenance (such as annual servicing) and specialist maintenance (such as blade inspections) is often drawn from a pool of travelling technicians who travel from site to site across the UK according to maintenance cycles and repair need³⁷. Given this it is unlikely that many such jobs are created specifically in South West Wales, although they may contribute towards demand for roles in the area and induced benefits such as spend in local accommodation, hospitality, and other services connected to maintenance cycles at the wind farm.

14.5.20 Based on the modelling taking into account baseline data and GVA, during the O&M phase the wider UK will see 399 direct and 174 indirect FTE job years created or safeguarded over the 35 year lifetime of the scheme. 281 direct and 148 indirect FTE job years will be created or safeguarded in Wales, and 44 direct and 11 indirect in the local area over the O&M phase. This provides a total of 573 FTE in the wider UK, 429 FTE in Wales and 55 FTE in the local area of job years.

Table 14.5 Jobs created and safeguarded during the Operational phase

Area	Direct jobs (FTE)	Indirect jobs (FTE)	Total jobs created/ safeguarded	Impact	Magnitude
Local	44	11	55	Positive	Medium
Wales	281	148	429	Positive	High
UK	399	174	573	Positive	High

Decommissioning

14.5.21 Given there is little available insight into the retention of expenditure on decommissioning the site, all content is assumed to be retained in the UK from the initial cost estimate of £1m. Converting to GVA using appropriate SIC codes for demolition, covered by specialised construction activities an estimated £249k in GVA is expected to be generated in the wider UK, of which £162K in Wales. This corresponds to 6 FTE job years in the wider UK and 4 in Wales. There are also ambitions among some turbine manufacturers to be zero waste by 2040 and around 90% of the turbine is expected to be recycled.³⁸

Social impacts

14.5.22 During the construction and development phase, the established practice is to conduct stakeholder engagement work to identify community priorities for economic development in the surrounding areas and identify where it can be linked to the renewable sector and permit local residents and organisations to access supply chains created by the location of renewable infrastructure.

36 The socioeconomic impacts of wind energy in the context of the energy transition, KPMG, 2019

37 Calculating the economic contribution of Beatrice Offshore Wind Farm Ltd., SSE, 2019

38 <https://www.vestas.com/en/about/sustainability#!sustainability-strategy>

- 14.5.23 Quantifying the benefits and impacts of a community fund is dependent on the types of activities or projects that the community wish to fund. For instance, infrastructure and facilities projects likely to have wider economic impacts than social activities, and the spread of funding will have an impact.
- 14.5.24 Community funds can be used by the community for anything considered important to them. They present opportunities for substantial investment in local amenities as well as for economic regeneration and development. At other wind farms, community fund allocations have been used to support local voluntary groups, sports teams and clubs, village halls and community centres, and equipment for schools. They have also been used to support economic outcomes including community cooperatives, such as shops, training provision for local residents and infrastructure investment such as high speed broadband.
- 14.5.25 As identified in the section on social impacts during the construction phase, establishing a community benefit fund or adopting a shared ownership model which was initially proposed by the Developer at 10% will help provide financial benefits to a community that hosts a wind farm. Welsh Government have set a target for increasing local ownership to 1GW of renewable projects by 2030 and every project having an element of local ownership from 2020 onwards.³⁹ Given the potential structures that a shared ownership approach could take, community benefit funds are simpler to express as most developers adopt Renewable UK protocol where £5,000 per MW of installed capacity or equivalent is to be provided to a community run fund per year for the duration of operation. For Mynydd Fforch Dwm, this model would be expected to have an up to £175K per annum community fund, or £4.4 million over a 35 year lifespan.
- 14.5.26 The amendments to the initial proposal following community consultation may impact the 10% shared ownership model initially proposed by the Developer. An alternative proposal is for the community to own one of the turbines. Following the project change from seven to six turbines, this ownership model would increase community ownership from one seventh to one sixth. Monetary contributions would therefore be based on the financial performance of the community-owned turbine, rather than a fixed-rate stipend. Community-owned turbines elsewhere in Wales and Scotland have shown to provide considerable returns to the community, far beyond those of the £5,000 per MW grant. In Orkney, a 0.9MW community-owned turbine in Westray returned just under £300,000 to the community per MW per annum which translates into £6.8 million over its 25-year lifespan⁴⁰. For the solar array, envisaged to yield c.6MW, the community benefit would be £500 per MW.
- 14.5.27 This would bring significant local benefits to the community, for example by boosting the local economy and providing funding to tackle other issues at local level, such as improving transport connections, and local projects to support job creation, training, and improving local skills.
- 14.5.28 This aligns to the Welsh Government's Regional Energy Strategy for South West Wales which seeks to encourage community developers to play an active role in delivering additional capacity for renewable energy and recognises the significance of local and community ownership of renewable energy assets. The Regional Strategy recognises that South West Wales has the potential to respond to opportunities from renewable energy generation, but

³⁹ Energy Generation in Wales, Welsh Government, 2018

⁴⁰ A comparison of the financial benefits arising from private and community owned windfarms, Aquatera, 2021

the capacity of the support, knowledge and skills base needs to be improved and expanded in order to respond to these opportunities and investment.

14.5.29 Estimates based on the experience evaluating other community funds suggest that a mix of community projects including infrastructure and facilities, business development and social activities will receive support. Modelling proportions across these activity types based on other community funds with the expected Mynydd Fforch Dwm fund totals would suggest the impacts set out in table 14.6 below. Additional Community participation, wellbeing, cohesion and civic pride can all be important soft impacts too and may be in addition to hard economic benefits generated by schemes themselves.

Table 14.6 Total impacts of a Community Fund at Mynydd Fforch Dwm Wind Farm

Impact	Total	Impact Area	Impact	Magnitude
Initial Spend	£9,625,000	Community	Positive	High
Direct Jobs Created Total	76.5 FTE	Community	Positive	Medium
Direct Jobs Safeguarded Total	35 FTE	Wales	Positive	Medium
Multiplied Jobs Safeguarded Total	16 FTE	UK	Positive	Low
Multiplied Additional Spend	£3,135,825	UK	Positive	Medium
Total Local Earnings	£1,932,706	Community	Positive	High
Direct GVA	£3,330,174	Wales	Positive	High
Multiplied GVA	£1,084,971	UK	Positive	Medium

Tourism and recreation impacts

14.5.30 The evidence on recreation impacts made here is based on concerns raised by NPTCBC in response to stakeholder consultations, as well as that established in the wider literature research from other wind farms. Recreation impacts focus on how local residents may change the way they engage with recreational activity in the area. Where this change in usage may affect economic factors such as local amenities and facilities or lead to further travel for similar recreational experience, these will be considered.

14.5.31 The proposed development is located ~2 km from the Afan Forest Mountain Bike Trails and the Afan Bike Park, in addition to the hiking trails in Afan Forest Park. Outdoor recreation is therefore an important tourism offer for the region, for both overnight visitors and day visitors from elsewhere in Wales. To the north west of the proposed development site there is Gnoll Country Park and Waterfall and Craig Gwladys Country Park. There are also historical monuments in the area such as Maen Bredwan Standing Stone Megalith, and art installations such as the Stargazing Hare. Several hotels, restaurants, a golf course and cafes are also located within 5 km of the site, mostly along the A4107 to the south of the site and north west along the A465. Neath (population 51,581 in 2019⁴¹) approximately 4 km to the west of the proposed site is the closest population centre offering a range of amenities and services.

41 ONS Census data, 2021

- 14.5.32 There is an accommodation provider, Bryn Bettws Lodge, and Campbell Coaching providing outdoor activities located within close proximity of the proposed Mynydd Fforch Dwm site. In addition to existing tourism and recreation infrastructure, an additional site Wildfox Resort has also been consented in 3.2km from Mynydd Fforch Dwm. It will consist of 600 lodges/apartments and a 100-bed hotel with restaurants, leisure facilities and adventure activities. There are also a number of consented residential sites planned for construction within a 10 km radius of the Mynydd Fforch Dwm site. This includes Meadow Road (52 units) at 5.1 km from the proposed development, and Chain Road (up to 50 units), Sandfields (55 flats), and Aberavon (137 units) at 8.4 km, 8.5 km, and 8.8 km respectively.
- 14.5.33 In terms of the existing businesses and proposed housing developments (if completed prior to Mynydd Fforch Dwm entering the construction phase) identified above, whilst there may be some disruption during the construction phase of the development to paths and access, these will be short term and temporary. Using the definitions of severity this construction impact on recreation is considered a minor impact. While there is often a perception that wind farms have a detrimental impact on tourism in the area there is mixed evidence that onshore wind farms reduce visitor numbers to an area during the build and operation of a wind farm⁴². A 2008 report commissioned by the Scottish Government, the Moffat Report, found that even during worse-case scenario of impact on tourism numbers, this would be more than balanced by the economic benefits brought to the local area by the wind farm⁴³. In addition, a 2014 report to Welsh Government found that there has been a limited impact of operational wind farms on tourism, although this is recognised that at time of writing the number of wind turbines in operation was much lower and to date there is limited literature on the cumulative impacts of wind farms on tourism⁴⁴. However, given that visitor numbers to Wales and to South West Wales in particular have continued to grow despite an increase in small onshore wind farms in the past decade, it can be concluded that the impact on tourism of an expanding onshore wind sector in Wales is negligible⁴⁵.
- 14.5.34 Within the literature, there is some evidence that wind farms reduce consumer surplus (the amount of value placed on something) from recreation by 20%⁴⁶. Journey time is also a crucial factor in recreation use, with residents who have a range of options locally likely to be less affected by a wind farm development than those with fewer choices. Therefore, rural developments are favourable in their impact on recreation use with the proposed Development similarly hosting few settlements in immediate proximity which would limit options for recreation space. However, a 2011 study in Scotland surveyed consumers in the UK and Scotland to understand how the presence of wind farms might influence a decision on an overnight stay. Of those surveyed, 80% in UK respondents, stated that the presence of a wind farm in the vicinity would have no impact on their decision to visit the area, which increased to 83% among Scottish respondents⁴⁷. Renewables Cymru commissioned a similar report in Wales in 2013 which found that the presence of a wind farm would not influence the decision of 66% of respondents to visit that area, and 67% in Wales, while 8% and 7% respectively did not know⁴⁸.

42 The Impact of Wind Farms on Scottish Tourism, Climate Exchange, 2012

43 *ibid*

44 Study into the potential economic impact of wind farms and associated grid infrastructure on the Welsh tourism sector, Regeneris Consulting (for Welsh Government), 2014

45 Wales Visitor Economy Profile: 2021, Welsh Government, 2021

46 *ibid*

47 Wind Farm Consumer Research Topic Paper, Insight Department, 2011

48 RenewableUK Cymru Poll Results, YouGov plc, 2013

14.5.35 While the grouping of several small wind farms locally can have an impact by potentially limiting the number of options for recreational use of land for residents, with more sites given over to wind farms and therefore less uninterrupted space available, there can be opportunities for opening up usage.

14.5.36 Whilst judgements can be reached on the potential implications for recreational use from a wind farm development, it must be noted that there are many local factors that will affect this use, from existing land utilisation to any new infrastructure developed. The negative impact caused by the proposed Development on recreation, without mitigation/enhancement, is therefore to be considered of minor significance.

Public Rights of Way (PRoW)

14.5.37 There are public rights of way through the proposed site. Given the direction of the main path in the eastern section of the proposed site runs through neighbouring wind farms, it is envisaged that there will be minimal additional impact from the operation of the Mynydd Fforch Dwm Wind Farm. There may be some disruption during the build and construction phase, but careful planning and management can minimise any negative effects (see 13.7.14-17).

Solar Development

14.5.38 The Mynydd Fforch Dwm proposal includes plans for a solar development in the MB section of the site. In the area of study, there are no other proposed solar developments in direct proximity, and the nearest solar farm is over 20 km away. In addition to job creation as a result of the development and construction of the wind farm, the proposed solar farm may contribute local and national jobs and GVA.

Wider impacts

14.5.39 In addition to the operational impacts beyond those listed above, the proposed development site may bring some further benefits and impacts. This is not an exhaustive list however and there are likely to be unforeseen wider impacts that emerge throughout the lifecycle of the wind farm.

14.5.40 In terms of benefits for the local community, training staff supporting the developer and contractors working on the wind farm is likely to bring skills benefits.

14.5.41 As part of the procurement process, the developer may utilise local industry groups to promote the opportunity of supporting the wind farm development in the supply chain. This will help secure local suppliers where available and the primary contractors will be encouraged to utilise local labour and subcontractors where appropriate. This will help to grow local businesses and increase experience enabling these suppliers to meet larger contracts as well as supporting or raising the local content of spend outlined in the sections above.

14.6 Additional Mitigation

Construction Phase

- 14.6.1 To address the impacts of building Mynydd Fforch Dwm wind farm, several mitigation measures have been proposed. This includes careful management and transparency in communicating with communities regarding access to the site, and clear communication regarding any impact on access to the public rights of way that traverse the proposed site.

Operational Phase

- 14.6.2 During the operational phase, improved PRow access and signage for the area in and around the site as a consequence of the operating wind farm could have a positive impact on recreation and tourism use of the area and help to mitigate the impacts noted in the section above in relation to the construction phase. There could also be opportunities for other economic benefits arising from increased activity in the area should visitor numbers for the purposes of recreation increase, for example food outlets or public amenities.

However, while these benefits could occur, it is not possible to predict or quantify and therefore no estimate of impact significance is considered here.

14.7 Residual effects

Construction Phase

- 14.7.1 Where negative impacts have been identified during the construction phase, these are mainly temporary and related to the physical impact of building a wind farm in a rural area. However, following planning and management these effects are considered to be minimal and, where impacts are felt by the local communities, short-lived.

Operational Phase

- 14.7.2 Lasting residual effects on recreation or tourism are considered to be of minor significance, and potentially even with no impact, or a positive impact when the mitigation measures are considered. Skills and experience benefits of individuals and companies participating in the development of the wind farm will be residual and positive, though are of a minor significance. The economic impacts detailed above for jobs created or safeguarded and GVA are of a major significance and provide an important benefit of the wind farm that outweighs the minor negative impacts.

14.8 Implications of Climate Change

- 14.8.1 UKCP18 provides the latest information on the future climate of the UK, but it does not include direct conclusions or information regarding impacts. Predicting the impact of climate change on socio-economic context of the area surrounding the proposed development can therefore only be derived from the evidence available at a high-level and it is unlikely that any new direct impacts will arise from climate change and rising sea levels in Wales.
- 14.8.2 For the onshore wind sector, supply chains pose the greatest socio-economic risk in terms of health and safety, sustainability and carbon emissions during the manufacturing, transportation and installation phases as well as source materials, and vulnerabilities due to

changing market conditions and economic volatility⁴⁹. In 2015, the ISO 14001 was amended and adapted to a changing context to balance protection of the environment more closely with socio-economic needs⁵⁰. The standard was initially developed as framework for environmental management system for organisations to consider the environmental conditions and their impact on business. The upgraded version now incorporates social factors such as procurement and development of sustainable, local-based supply chains, stakeholder engagement and working more closely with communities.

- 14.8.3 In summary, the projections outlined in UKCP18 towards hotter, drier summers and warmer, wetter winters across the UK as a whole, sea-level rises of 0.69m in Cardiff (higher than 0.49m in Edinburgh and 0.52m in Belfast)⁵¹ by year 2100 in a medium scenario will have indirect socio-economic impacts. These could likely involve disruption to supply chains, as well as health and safety factors such as loss of work due to heat.

14.9 Cumulative effects

- 14.9.1 The proposed development site is 0.4km from Pen y Cymoedd wind farm (76 turbines with a total capacity of 228MW) 1.3km from the boundary of Ffynnon Oer wind farm (16 turbines with a total capacity of 32MW), and 7.8 km from Mynydd Brombil (4 turbines with a total capacity of 8MW). Other wind farms within the administrative boundary of Neath Port Talbot include Maesgwyn (13 turbines and solar farm at 33.5MW in total) at 14 km from the proposed development site, and the Llynfi Afan Renewable Energy Park (12 turbines at 18MW) at 5 km from the proposed site. Further proposed sites include Melin Court (5 turbines at 18MW) which would be approximately 2.6 km to the north east of the Mynydd Fforch Dwm site. There may be cumulative impacts from the clustering of similar projects in one area.
- 14.9.2 An onshore wind cluster in one area may bring beneficial results particularly related to supply chain capacity and sharing of operational expertise. Access to spare parts in case of turbine failure may be improved and the need for ongoing maintenance within one area may facilitate the development of a skilled labour pool within the area, which will help safeguard future jobs and retain some of the local impacts outlined in the sections above. In addition, supply chains may be developed during the construction phase of Mynydd Fforch Dwm, attracting new and existing businesses and niche suppliers to enter the market or re-locate to the area to serve the growing needs of the onshore wind industry.
- 14.9.3 This might also include support facilities to serve the wind farms such as spare parts storage, specialist logistics for transporting turbine major components, and suppliers and operators related to craneage of spare parts⁵². This is likely to be gradual but in the long run will support development of a high value economy and fulfil the strategic aims of economic development policy for the region. The Baglan Park Industrial Park, planned for 7.2 km from the proposed site, for example may provide suitable facilities for development warehouse storage for the wind farms in the future. Mardon Park, an Industrial Unit consented for 7.2 km from the proposed site, is an example of storage and distribution facilities planned in proximity to Mynydd Fforch Dwm.
- 14.9.4 Within 10 km of the proposed development site, there are two industrial activities for consideration in terms of boosting economic activity and bringing potential to further stimulate

49 Climate Change Risks and Adaptation Responses for UK Electricity Generation: A Sector Overview, Energy UK, 2021

50 Ibid.

51 In-depth Q&A: The UK Climate Projections 2018, Carbon Brief, 2018

52 Local Supply Chain Opportunities in Onshore Wind, RenewableUK, 2014

the labour market in NPT. The Hirwaun Power Station, a gas-fired power generation plant with a capacity to generate 299MW, has been consented 7.6 km from the Mynydd Fforch Dwm wind farm site. There is also a Sandvik Osprey metal processing plant in planning at a 28,500 sqm site 8.4 km from the proposed wind farm.

- 14.9.5 No negative cumulative effects are expected on the economy and the scale of positive benefits that may be reasonably predicted are of minor significance.

14.10 Summary

14.10.1 The Mynydd Fforch Dwm wind farm will produce substantial amounts of GVA and safeguard or create hundreds of jobs. These will be spread locally and across Wales as well as the rest of the UK. The benefits of the construction and operation phases are likely to be substantial for the local area and will be supported by the social benefits that may come from the community benefit fund or shared ownership. The expected social and economic impacts generated by the Mynydd Fforch Dwm wind farm are mostly positive and where there are negative impacts arising beyond the temporary construction phase these are of minor significance.

14.10.2 The economic impacts covered in this chapter are summarised in the tables below.

Table 14.7 Summary of socio-economic impact of development of Mynydd Fforch Dwm

Indicator	Local	Wales	UK	Impact	Magnitude
Direct GVA (Dev)	£73,500	£352,000	£656,300	Positive	Medium
Indirect GVA (Dev)	£13,600	£93,500	£286,700	Positive	Medium
Total GVA (Dev)	£87,000	£445,500	£940,000	Positive	High
Direct GVA (Con)	£1,400,000	£7,889,000	£11,559,000	Positive	High
Indirect GVA (Con)	£385,000	£1,620,000	£3,327,000	Positive	High
Total GVA (Con)	£1,793,000	£9,513,000	£14,886,400	Positive	High
Direct GVA (O&M)	£3,385,000	£21,663,000	£28,277,000	Positive	High
Indirect GVA (O&M)	£924,000	£4,420,000	£7,490,000	Positive	Medium
Total GVA (O&M)	£4,309,000	£26,083,000	£35,766,000	Positive	High
Direct GVA (Decomms)	£25,000	£162,000	£249,000	Positive	High
Indirect GVA (Decomms)	£9,000	£45,000	£85,000	Positive	Medium
Total GVA (Decomms)	£34,000	£207,000	£334,000	Positive	High
TOTALS	£4,891,000	£30,065,000	£40,741,000	Positive	High
Direct FTE jobs created / safeguarded (lifecycle)	64	394	558	Positive	High
Indirect FTE jobs created / safeguarded (lifecycle)	16	192	586	Positive	High
TOTALS	80	586	847	Positive	High

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15 Mitigation, residual and interaction effects

15.1 Introduction

- 15.1.1 This final chapter provides a summary of the proposed mitigation and the residual effects predicted following their implementation. This chapter does not provide a summary of the ES, a Non-Technical Summary is provided separately.
- 15.1.2 The summary of proposed mitigation measures set out below is provided to assist in formulating the wording of planning conditions and clauses of the legal agreement, to ensure that the measures presented in this ES are implemented. This demonstrates the applicants' commitment to the implementation of all necessary mitigation measures in agreement with NPTCBC.

15.2 Additional mitigation and residual effects

Aviation and Telecommunications, Shadow Flicker and Safety

- 15.2.1 The turbines will all be in radar line of sight of the radar at Cardiff Airport. In common with several other wind farm developments in South Wales, it is technically feasible to mitigate the effects of the turbines. There are at least two possible technical solutions that have been discussed, the most likely being the installation of a Terma Scanter 4002 radar at the airport. A contribution towards such an upgrade can be secured by way of a Section 106 planning obligation. Following this, it is not considered likely that any significant effects will occur in relation to aviation.
- 15.2.2 If a complaint is made regarding shadow flicker, an investigation would take place to determine which turbines were, or were not, creating the effect and the extent of the shadow flicker created. If the investigation confirms a loss of residential amenity, a technical mitigation measure built into the turbines would be activated. This applies to the residential property Fforch-dwm House, the only property that could potentially experience shadow flicker. Following implementation of mitigation through the implementation of a turbine shut down module, it is considered that there will be no significant effects in relation to shadow flicker as a result of the Proposed Development.
- 15.2.3 Regarding the potential effects on telecommunication links, consultation with the key providers confirmed no predicted interference, apart from Arqiva, which advised of an effect on one UHF communication link by one of the proposed turbines. Further detailed assessment by Arqiva confirmed that there is a technically viable mitigation solution that does not require turbine movement. An agreement with Arqiva will be made to implement that mitigation. Impacts on satellite television reception are not anticipated because dwellings are not located within signal shadow zones associated with the proposed wind turbines.

Landscape and Visual Effects

- 15.2.4 All mitigation for landscape and visual effects is included in the design of the Proposed Development such that no additional mitigation measures are proposed.
- 15.2.5 There are residual effects predicted that are assessed as significant on the following receptors. A major/moderate adverse effect is predicted for the Cwm Afan and Cwm Pelenna Landscape Character Areas, and for visual receptor groups including users of Public Rights of

Way, and users of the mountain centre at Bryn Bettws Lodge. A major adverse effect is predicted for visual receptors at Tonmawr.

Noise and Vibration

- 15.2.6 It is proposed that the method and approach to construction works for the duration when the site access construction is within 100 m of Brynhyfryd House will focus on reducing and minimising the noise level at the property boundary. Initial suitable measures are outlined in the Outline Construction Environment Management Plan and will be included in further detail in the detailed Transport Management Plan when it is prepared by the contractor.
- 15.2.7 Following implementation of suitable mitigation measures, the construction activities are predicted to result in temporary minor residual effects, which are not significant.
- 15.2.8 The selection of equipment and noise reduction measures in the detailed design of switching station and solar array will be specified to achieve acceptable noise limit at the nearest properties. A planning condition can be imposed to ensure wind turbine noise remains within the ETSU-R-97 noise limits. This would include the requirement that, in the event of a noise complaint, noise levels resulting from the operation of the wind turbines on the Site are measured, in order to demonstrate compliance with conditioned noise limits. It is considered that the proposal would result in a minor adverse residual effect at most, which is not significant.

Ecology

- 15.2.9 Measures to mitigate effects on ecology have been designed into the scheme as inherent design mitigation measures. These measures include a 50 m buffer between turbines and habitat features to reduce the number of bats commuting near to the turbines. Measures to protect the environment during the construction phase of the Proposed Development will be set out in a CEMP to be implemented at the commencement of works. A Protected Species Protection Plan would form part of the CEMP, which would provide for pre-construction surveys for protected species including terrestrial mammals, reptiles and amphibians. Reasonable Avoidance Measures methods statements will also be included in the CEMP, which will detail specific species and habitat protocols to be followed for survey and construction activities. A Ecological Clerk of Works would be employed to oversee these mitigation measures and working practices on the site.
- 15.2.10 With the implementation of the inherent design mitigation measures outlined above, no significant effects upon ecological receptors are predicted to occur as a result of the Proposed Development. Therefore, additional mitigation measures are not required.
- 15.2.11 In respect of potential cumulative effects, monitoring data from the adjacent Pen y Cymoedd Wind Farm has demonstrated that bat fatalities do occur locally, and therefore the cumulative effects have the potential to become significant. Therefore, in accordance with the Joint Agencies (2021) guidance '*Bats and Onshore Wind Turbines*', it is proposed that there will be a precautionary measure to reduce idling speeds for the proposed turbines. Compared with normal idling, a reduction may reduce fatality rates by up to 50%. This approach is recommended where there remains uncertainty over the risk posed to bats.
- 15.2.12 With the implementation of reduced idling speeds at the proposed turbines, no significant cumulative effects upon bats are predicted to occur as a result of the Proposed Development.

- 15.2.13 Post-construction monitoring is proposed to assess bat activity from the outset of the operational phase of the Proposed Development, over a period to be agreed with PEDW, in consultation with NRW. This will assess bat activity and the efficacy of mitigation.

Ornithology

- 15.2.14 There are no significant adverse effects predicted for any important ornithological receptor as a result of the construction, operation or decommissioning of the Proposed Development, either alone or cumulatively with other developments. As such, and in accordance with CIEEM guidance, no additional mitigation is required.

Geology, Hydrology and Hydrogeology

- 15.2.15 With the good practice measures that a developer would implement as standard practice, no specific mitigation during construction is required. There are no significant residual effects predicted.
- 15.2.16 During operation, routine maintenance of infrastructure would be required. This may include work such as maintaining drainage devices, removing sedimentation from structures and turbine maintenance. Should any maintenance be required onsite during the operational life of the project that would involve construction type activities, controls would be implemented with reference to the measures in the CEMP to avoid potential effects.

Archaeology and Cultural Heritage

- 15.2.17 To mitigate direct impacts upon Cwm Pelenna Colliery Ventilation Furnace (GM458), it is recommended that a section of 'floating road' is put in place (Figure 4.10). This would avoid direct and physical impacts upon the archaeology of the Scheduled Monument.
- 15.2.18 If this is not possible due to engineering constraints, then the proposed work in this area would require a detailed Scheduled Monument Consent (SMC) application submitted to Cadw. This would include a written explanation of the proposal, plans, levels and construction methods for the road, and how that would affect the Scheduled Monument (protected, retained, or enhanced). It is also likely that a Heritage Impact Assessment (HIA) would need to be submitted alongside the SMC application.
- 15.2.19 To mitigate direct impacts upon the medieval platform site (00693w), it is recommended that a 'floating road' scheme is used. This would avoid direct and physical effects upon the non-designated medieval site (Figure 4.10). If this is not possible, then it is recommended that archaeological mitigation is undertaken to record and monitor during ground works associated with the construction of the access track in this area.
- 15.2.20 It is also recommended that the Site should be the subject of a geophysical survey to identify unrecorded archaeological remains. A Written Scheme of Investigation is presented in Appendix 12.1 (Appendix 5).
- 15.2.21 The non-physical (indirect) effect upon the Cwm Pelenna Colliery Ventilation Furnace (GM458) and Cwm Pelenna Ventilation Stack (22888) is assessed as a minor to moderate adverse residual effect. All residual effects identified in the heritage assessment are not significant in EIA terms.

Transport and Access

- 15.2.22 A Traffic Management Plan will implement mitigation measures for construction traffic (Appendix 13.2).
- 15.2.23 NPTCBC may require an agreement to cover the cost of abnormal wear and tear on the road network leading from the A465 to the Site. Video recording of the pre-construction condition of the access route to be used by abnormal loads and the construction vehicles route will be provide a baseline of the road condition. Damage to road infrastructure caused directly by construction traffic will be made good, and street furniture that is removed on a temporary basis will be fully reinstated.
- 15.2.24 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.
- 15.2.25 Information on the wind turbine convoys will be provided to local media outlets such as local papers and local radio to help assist the public. Information will relate to expected vehicle movements from the port of entry through to the Site. This will help reduce potential inconvenience.
- 15.2.26 Consideration will be given to pedestrians and cyclists alike, due to potential interactions between construction traffic and users of the public rights of way network. These measures will be formulated into a Path Management Plan.
- 15.2.27 Following the implementation of the above mitigation measures, it is not considered likely that the Proposed Development would result in significant effects relating to transport.

Socio-economic effects

- 15.2.28 To address the impacts during construction, several mitigation measures have been proposed. As noted above, this includes careful management and transparency in communicating with communities regarding access to the Site, and clear communication regarding any impact on access to the public rights of way that traverse the proposed site.
- 15.2.29 Improved access to public rights of way and signage for the area in and around the Site as a consequence of the operating wind farm could have a positive impact on recreation and tourism use of the area. There could also be opportunities for other economic benefits arising from increased activity in the area should visitor numbers for the purposes of recreation increase, for example food outlets or public amenities.
- 15.2.30 Where negative impacts have been identified during the construction phase, these are temporary and relate to the physical impact of building a wind farm in a rural area. However, following planning and management, these effects are considered to be minimal and, where impacts are felt by the local communities, short-lived.
- 15.2.31 Lasting residual effects on recreation or tourism are considered to be a minor positive residual effect when the mitigation measures are considered. Skills and experience benefits to individuals and companies participating in the development of the wind farm will be a minor positive residual effect.
- 15.2.32 The Proposed Development would create approximately 847 full time equivalent jobs across the UK, with 80 in the local area. Across the lifespan of the development, it is predicted to result in £40,741,000 in GVA across the UK, with £4,891,000 in GVA in the local area. The

economic impacts for jobs created or safeguarded and GVA are of a major significance and provide an important benefit of the wind farm that outweighs the minor negative impacts.

15.3 Consideration of interaction effects

- 15.3.1 Table 15.1 and 15.2 show the interaction effects considered through the construction and operational phases.
- 15.3.2 The potential for effects caused by a combination of impacts from the Proposed Development on a particular receptor, acting together, may cause a more significant beneficial or adverse impact collectively than individually. For interaction between effects to be possible, there would need to be an identifiable residual effect from one or more environmental aspects after considering the mitigation proposed.
- 15.3.3 Using the In-Combination effects defined in Tables 15.1 and 15.2 overleaf, it is predicted that there would be potential for adverse effects through the construction phase and operational phase.
- 15.3.4 During the construction phase (Table 15.1), there are minor adverse impacts which may affect local residents, mostly relating to transport, construction noise and PRoW access. These will be managed through the implementation of mitigation measures set out in the CEMP and Transport Assessment. With such measures in place, temporary effects on receptors from this combination of sources are not predicted to result in a greater level of effect.
- 15.3.5 After completion of the proposal (Table 15.2), there are significant effects predicted for landscape and visual receptors and a minor adverse effect relating to operational noise. Given that the effects on landscape and visual receptors are significant in EIA terms individually, it is considered possible that they could combine to produce a significant interaction effect.
- 15.3.6 During both phases, there is a high beneficial effect relating to job support from the scheme. Whilst this effect is beneficial, it is considered that it would not significantly alter the conclusions as set out above.
- 15.3.7 Based upon the conclusions presented in the preceding technical chapters, and taking into account mitigation measures proposed, significant interaction effects are only considered likely during the operational phase on local residents as a result of the interaction between landscape and visual effects and operational noise effects.

Table 15.1 In-Combination Effects during Construction

Nature of Residual Effect	Population	Ecological Receptors	Landscape Features	Water Environment
Construction noise	Temporary Minor adverse			
Displacement / disturbance Red Kite		Minor adverse		
Excavation of peat		Minor adverse	Minor adverse	
Change of hydrological regime		Minor adverse		Minor adverse
Transport - Severance	Minor adverse			
Transport - Pedestrian delay	Minor adverse			
Transport - Amenity	Minor adverse			
Transport - Fear and intimidation	Minor adverse			
Transport - Accidents & safety	Minor adverse			
Public Rights of Way users	Minor adverse		Minor adverse	
Jobs created	High beneficial			
Habitat loss for bats		Minor adverse		

Table 15.2 In-Combination Effects during Operation

Nature of Residual Effect	Population	Ecological Receptors	Landscape Features	Water Environment
Cwm Afan and Cwm Pelenna Landscape Character Areas			Major/Moderate adverse	
Users of PRoW and access land across the Site and within 2km, and within 3km south and south east of Cimla	Major/Moderate adverse		Major/Moderate adverse	
Tonmawr visual receptors	Major adverse			
Bryn Bettws Lodge visual receptors at night	Major/Moderate adverse			
Operational noise	Minor adverse			
Displacement/disturbance/collision mortality of Red Kite		Minor adverse		
Interruption of shallow groundwater flow				Minor adverse
Turbine foundations reducing groundwater recharge				Minor adverse
Jobs created	High beneficial			
Bat collision mortality		Minor adverse		

15.3.8 A tabulation of the mitigation measures proposed throughout the assessment and the predicted residual effects is provided overleaf in Table 15.3.

Table 15.3 Summary of mitigation measures and residual effects

Identified receptor	Type and purpose of additional mitigation measure	Means by which mitigation may be secured	To be delivered by	Auditable by
Aviation and Telecommunications, Shadow Flicker and Safety				
Construction Phase				
Cardiff Airport	Mitigation strategy to mitigate impacts on radar at the airport.	Planning condition	The Applicant	NPTCBC
Arqiva Communications	Agreement to implement technical solution	Planning condition	The Applicant	NPTCBC
Operation Phase				
Local Residents	Shadow flicker to be investigated upon complaint. A shadow flicker control module can be used to shutdown relevant turbines to mitigate impacts of shadow flicker on nearby residents.	Planning condition	The Applicant	NPTCBC
Landscape and Visual				
Construction / Decommissioning				
All mitigation is embedded in the design of the scheme.				
Operation Phase				
All mitigation is embedded in the design of the scheme.				

Identified receptor	Type and purpose of additional mitigation measure	Means by which mitigation may be secured	To be delivered by	Auditable by
Noise and Vibration				
Construction / Decommissioning				
Brynhyfryd House	Design of site access work within 100 m of the property and scheduling of this work to minimise noise levels.	CEMP (secured by planning condition)	Contractor.	Local Authority.
Operation Phase				
Residential properties	Plant selection and noise reduction measures applied in detailed design to achieve noise limit at neighbouring properties (prevent).	Planning condition.	Applicant.	Local Authority.
Residential properties	Selection of final turbine model to meet operational noise limits for wind turbines (prevent).	Planning condition.	Applicant.	Local Authority.
Ecology				
Construction / Decommissioning				
No additional mitigation proposed.				
Operation Phase				
No additional mitigation proposed.				
Ornithology				
Construction Phase				
No additional mitigation proposed.				
Operation Phase				
No additional mitigation proposed.				

Identified receptor	Type and purpose of additional mitigation measure	Means by which mitigation may be secured	To be delivered by	Auditable by
Geology, Hydrology and Hydrogeology and Peat				
Construction / Decommissioning				
Watercourses (Nant Blaenpelenna)	Adherence to industry standard good practice and design to incorporate appropriate drainage to maintain local hydrology (CEMP). Bridge design to consider flood risk and surface water flow morphology.	Planning Condition	Contractor	NPTCBC
Operation Phase				
Groundwater	Maintenance of appropriate site drainage to ensure shallow hydrogeological regime is maintained.	Planning Condition	Applicant	NPTCBC
Archaeology and Cultural Heritage				
Construction Phase				
Cwm Pelenna Colliery Ventilation Furnace (GM458)	Floating road scheme to prevent physical harm to Scheduled Monument.	Planning Condition	Contractor	Applicant
Non-designated medieval platform site (00693w)	Monitor and record during ground works	Planning Condition	Contractor	Applicant
Operation Phase				
No additional mitigation proposed.				

Identified receptor	Type and purpose of additional mitigation measure	Means by which mitigation may be secured	To be delivered by	Auditable by
Transport and Access				
Construction / Decommissioning				
Users of Fforch-dwm Road	CTMP measures design to prevent and reduce effects.	Planning Condition	Contractor	NPTCBC
Residents of Fforch-dwm Road	CTMP measures design to prevent and reduce effects.	Planning Condition	Contractor	NPTCBC
Users of Ton-Mawr Road	CTMP measures design to prevent and reduce effects.	Planning Condition	Contractor	NPTCBC
PRoW Users	CTMP and Path Management Plan measures design to prevent and reduce effects.	Planning Condition	Contractor and Developer	NPTCBC
Operation Phase				
No additional mitigation proposed.				
Socio-Economic Effects				
Construction Phase				
Local communities, visitors to the area	Communicate in advance any impacts of increased traffic related to access to site during the construction phase and any changes to access on public right of way at the proposed development site to reduce the impact on members of the public, those living and working in the surrounding area.	Planning Condition	Applicant	NPTCBC
Operation Phase				
No additional mitigation proposed.				

16 Glossary

Acrotelm	In relation to peat, the acrotelm layer is found in the upper layer of peat where conditions are relatively dry. It comprises living vegetation and partially decomposed plant material.
AEP	Annual Exceedance Probability
AIL	Abnormal Indivisible Loads
ANSP	Air Navigation Service Providers
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ATC	Automatic Traffic Counts
Baseline	The existing (pre-development) landscape and visual context of a study area, including landscape fabric, landscape character and existing views. The landscape baseline is not static and may be changing for various reasons. The landscape baseline can also consider such factors and describe the likely future landscape character of the landscape, without the proposed development.
BBNP	Bannau Brycheiniog / Brecon Beacons National Park
BGS	British Geological Survey
CAA	Civil Aviation Authority
Catotelm	In relation to peat, the catotelm layer is found under the acrotelm layer and comprises decayed plant material and organisms. It is denser and with a very low hydraulic conductivity.
cd	Candela
CBBPP	Construction Breeding Bird Protection Plan
CEA	Cumulative Effects Assessment
CEMP	Construction Environment Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CNS	Communication, Navigation and Surveillance systems
CO ₂	Carbon Dioxide
CRM	Collision Risk Modelling
CROW Act	Countryside and Rights of Way Act 2000
CRTN	Calculation of Road Traffic Noise
Cumulative	An increase in an overall effect on a receptor as a result of multiple additions/sources

DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	The Design Manual for Roads and Bridges – a comprehensive manual system of current standards, advice notes and published documents relating to the design, assessment and operation of trunk roads and motorways
DNS	Development of National Significance
EA	Environment Agency
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
Effects	A predicted change in the environmental baseline as a result of the proposed development. Effects can be positive or negative.
EIA	Environmental Impact Assessment
EIA Regulations	The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017
EPR	Environmental Permitting Regulations 2016
ES	Environmental Statement. The document reporting the process and outcomes of the EIA. The ES reports the likely significant environmental effects of a project.
FCA	Flood Consequences Assessment
FTE	Full Time Equivalent
GGAT	Glamorgan-Gwent Archaeological Trust
GHG	Greenhouse Gas
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPP	Guidance for Pollution Prevention
GVA	Gross Added Value
GWDTE	Groundwater Dependent Terrestrial Ecosystems
ha	Hectare – 1 ha is an area equal to 10,000 square metres (2.47 acres)
HDV / HGV	Heavy Duty Vehicle / Heavy Goods Vehicle
HEDBA	Historic Environment Desk-Based Assessment
HER	Historic Environment Records
HIA	Historic Impact Assessment
HMP	Habitat Management Plan
HRA	Habitats Regulation Assessment
IEMA	Institute of Environmental Management and Assessment
IFP	Instrument Flight Procedure
Impact/Effect	The term impact is used to describe a change in conditions. The term effect is used to describe an environmental response resulting from an impact, or series of impacts.

JRC	Joint Radio Company
LDP	Local Development Plan
LDV / LGV	Light Duty Vehicle / Light Goods Vehicle
LPA	Local Planning Authority
LSOA	Lower Super Output Areas
LVIA	Landscape and Visual Impact Assessment
MB	Mynydd Blaenafon
MFD	Mynydd Fforch Dwm
MOD	Ministry of Defence
NCLA	National Landscape Character Area
NCN	National Cycle Network
NCR	National Cycle Routes
NO ₂	Nitrogen dioxide
NOMIS	Nomis is a service provided by the Office for National Statistics, ONS, to give the most detailed and up-to-date UK labour market statistics from official sources
NO _x	Oxides of Nitrogen
NPTCBC	Neath Port Talbot County Borough Council
NRTF	National Road Traffic Forecast
NRW	Natural Resources Wales
NTS	Non-technical summary (of the ES)
NVC	National Vegetation Classification
OHMP	Outline Habitat Management Plan
ONS	Office for National Statistics
OS	Ordnance Survey
PathMP	Path Management Plan
PMP	Peat Management Plan
PEDW	Planning and Environment Decisions Wales
PoE	Port of Entry
Pollution	The contamination of air, water, or soil by substances that can occur naturally or as the result of human activities
PPW	Planning Policy Wales
PROW	Public Right of Way
PYC	Pen Y Cymoedd
RAM	Reasonable Avoidance Measures
RCAHMW	Royal Commission on the Ancient and Historical Monument of Wales

Residual effects	The significant environmental effects remaining following mitigation
RVAA	Residential Visual Amenity Assessment
SAB	SuDS Approving Body
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency
SEWBRcC	South East Wales Biodiversity Records Centre
SINC	Site of Interest for Nature Conservation
SLA	Special Landscape Area
SMC	Scheduled Monument Consent
SPA	Special Protection Area
SPG	Supplementary Planning Guidance
SPZ	Source Protection Zone
SRN	Strategic Road Network
SRTM	Shuttle Radar Topography Mission
SSSI	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
SuDS	Sustainable Drainage System
SWTRA	South Wales Trunk Road Agent
TA	Transport Assessment
TAN	Technical Advice Note
The Applicant	Naturalis Energy Developments Ltd
The Site	extent of the planning application
TMP	Transport Management Plan
WFD	Water Framework Directive
WSI	Written Scheme of Investigation
ZTV	Zone of Theoretical Visibility



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