

7 ECOLOGY

7.1 Introduction

- 7.1.1 This chapter describes and evaluates the current ecological interest of the Site and the surrounding area. It provides the Ecological Impact Assessment and assesses the potential effects of the proposed Pen March Wind Farm (the 'Proposed Scheme') on important habitats and species. Where necessary, it also describes proposed mitigation, compensation and enhancement measures.
- 7.1.2 This chapter considers habitats and non-avian animal species. Potential effects on ornithology are considered separately in **Chapter 8: Ornithology (Volume 2)**. Together **Chapters 7 and 8** provide an assessment of the potential effects of the proposed scheme on biodiversity.
- 7.1.3 This chapter is supported by a number of technical appendices, as follows:
- **Technical Appendix 7.1: Desk Study Report (Volume 4)**
 - **Technical Appendix 7.2: Habitat Survey Report (Volume 4)**
 - **Technical Appendix 7.3: Bat Survey Reports (Volume 4)**
 - **Technical Appendix 7.4: Otter and Water Vole Survey Report (Volume 4)**
 - **Technical Appendix 7.5: Great Crested Survey Newt Report (Volume 4)**
 - **Technical Appendix 7.6: Outline Habitat Management Plan (Volume 4)**

7.2 Statutory and planning context

- 7.2.1 The assessment has been carried out with reference to the legislation, policy (National and Local) and guidance detailed in **Table 7.1**. The list of guidance is not exhaustive and other relevant guidance documents are referred to in this chapter as appropriate.

Table 7.1: Legislation and guidance relevant to Ecology

Document	Summary
Legislation	
The Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations)	The Habitats Regulations transpose the EC Habitats Directive (Council Directive 92/43/EEC) and certain elements of the Wild Birds Directive (Directive 2009/147/EC) into English and Welsh law. The regulations provide for the designation and protection of European sites, the protection of certain species (referred to as European Protected Species or EPS) and the adaptation of planning and other controls for the protection of European sites. These regulations were last amended in 2019 to make them operable from 1 January 2021 despite the UK's withdrawal from the European Union (EU).

Document	Summary
The Wildlife and Countryside Act (WCA) 1981 (as amended)	This Act consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Wild Birds Directive. This piece of legislation remains the primary UK mechanism for statutory site designations (such as Sites of Special Scientific Interest, SSSI) and the protection of individual species.
Protection of Badgers Act 1992	The Protection of Badgers Act 1992 makes it illegal to kill, injure or take a badger or to intentionally or recklessly interfere with a badger (<i>Meles meles</i>) sett. Sett interference includes disturbing badgers whilst they are occupying a sett or obstructing access to it.
Well-being of Future Generations Act (Wales) 2015	Requires development to be sustainable. Part 2 Section 4 Table 1 includes the goal: <i>“A resilient Wales: A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change”.</i>
The Environment (Wales) Act 2016	The Act makes provisions within Wales for the planning and managing of natural resources at national and local level. Section 6 of the Act introduces the biodiversity and resilience of ecosystems duty whereby public authorities are required to seek to maintain and enhance biodiversity so far as it is consistent with the proper exercise of those functions. Section 7 of the Act introduces a list of living organisms and types of habitat in Wales, known as Species or Habitats of Principal Importance, which in Wales are considered of key significance to sustain and improve biodiversity.
National Planning Policy	
Future Wales: The National Plan 2040	Future Wales sets the direction for development in Wales to 2040 and includes a Habitats Regulations Assessment. Policy 9 – Resilient Ecological Networks and Green Infrastructure outlines measures to ensure the enhancement of biodiversity, the resilience of ecosystems and the provision of green infrastructure.
Planning Policy Wales (PPW) Chapter 6 Distinctive and Natural Places (11th Ed.; 2021)	Chapter 6 of Planning Policy Wales (PPW) sets out the Welsh Government’s objectives for Distinctive and Natural Places. Topics covered include historic environment, landscape, biodiversity and habitats, coastal characteristics, air quality, soundscape, water services, flooding and other environmental (surface and sub-surface) risks. In particular, the Biodiversity and Resilience of Ecosystems section puts emphasis on planning authorities to have regard for the State of Natural Resources Report (SoNaRR) and Area Statements published by Natural Resources Wales (NRW).

Document	Summary
Technical Advice Note 5 (TAN5) Nature Conservation and Planning (2009)	The Welsh Government's policy on positive planning for nature conservation and developments affecting designated sites and habitats, along with protected priority habitats and species.
Natural Resources Policy (2017)	A key principle is <i>"Through actions such as increasing resource efficiency or reducing pollution, the aim is to build greater resilience into our ecosystems."</i>
Nature Recovery Action Plan (NRAP) for Wales 2020 – 2021	The objectives of the NRAP are to: - Engage and support participation and understanding to embed biodiversity throughout decision making at all levels - Safeguard species and habitats of principal importance and improve their management - Increase the resilience of our natural environment by restoring degraded habitats and habitat creation - Tackle key pressure on species and habitats - Improve our evidence, understanding and monitoring - Put in place a framework of governance and support for delivery
Local Planning Policy	
Caerphilly County Borough (CCB) Adopted Local Development Plan (LDP) 2010 – 2021	CCB LDP guides planning decisions within the county. The LDP includes a number of strategic policies, one of which is relevant to this assessment: Conservation of Natural Heritage.
The Replacement Merthyr Tydfil LDP 2016 – 2031	The Replacement Merthyr Tydfil LDP guides planning decisions within the county. The LDP includes a number of relevant strategic policies (EnW1, EnW2, EnW3, EnW4 and EcW8).
Draft Caerphilly Biodiversity Duty Plan (CBDP) 2017	The draft CBDP contains five objectives listed below: Objective 1: Engage and support participation and understanding to embed biodiversity through decision making at all levels. Objective 2: Safeguard species and habitats of principal importance and improve their management. Objective 3: Increase the resilience of our natural environments by restoring degraded habitats and habitat creation. Objective 4: Tackle key pressures on species and habitats. Objective 5: Improve evidence, understanding and monitoring.
CCB Biodiversity Action Plan	The overall aim of the Caerphilly Biodiversity Partnership is: To actively protect, conserve and enhance the biodiversity of CCB on a continuing basis.

Document	Summary
	The Caerphilly Biodiversity Action Plan (CBAP) contains seven objectives outlined below: 1. To set up a local partnership that is guided and represented by a steering group to coordinate and encourage the local BAP process. [Set up a partnership] 2. To examine existing information on habitats and species in the county borough, fill the information gaps and update regularly. [Find out what we have] 3. To select species and habitats and write local action plans that reflect the values of local people, and meet regional and national biodiversity priorities. [Write action plans for wildlife] 4. To raise awareness and appreciation of habitats and species in the county borough, and encourage their protection and enhancement. [Let everyone know what is happening] 5. To encourage all partners to incorporate targeted actions from the local BAP into their policy making processes. [Incorporate targets] 6. To measure the effectiveness of our LBAP and to report findings to the public as well as regional and national biodiversity groups. [Make sure we are doing it correctly] 7. To seek ways of adequately resourcing the local BAP process. [Seek funding] The CBAP habitat statements for 10 broad habitat groups; and 51 Species Action Plans (including 25 priority species).
Merthyr Tydfil Nature Recovery Action Plan (MTNRAP) 2019-2024	The MTNRAP contains six objectives, outlined below: Objective 1: Engage and support participation and understanding to embed biodiversity throughout decision-making at all levels. Objective 2: Safeguard species and habitats of principal importance and improve their management. Objective 3: Increase the resilience of our natural environmental by restoring degraded habitats and habitat creation. Objective 4: Tackle key pressures of species and habitats. Objective 5: Improve our evidence, understanding and monitoring. Objective 6: Put in place a framework of governance and support for delivery.
Guidance	
'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine	Guidance for the ecological impact assessment process.

Document	Summary
version 1.2'. (CIEEM, 2022)	
Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter & Bat Conservation Trust (2021) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation.	Guidance in relation to bat survey, assessment and mitigation in relation to wind farm developments.
English Nature (2001) Great Crested Newt Mitigation Guidelines Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F. (2014). 'Analytical and methodological development for improved surveillance of the Great Crested Newt', in Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (<i>Triturus cristatus</i>) environmental DNA.	Guidance relating to survey methodology.
Chanin P. (2003) Monitoring the Otter <i>Lutra lutra</i> . Conserving Natura 2000 Rivers Monitoring Series No.10 English Nature, Peterborough.	Guidance relating to survey methodology.
Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (the Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society: London.	Guidance relating to survey methodology.

7.3 Consultation undertaken

- 7.3.1 A summary of the key points from the 2020 Scoping Direction, relevant scoping responses and other consultations with relevant organisations, including comments received on the draft ES submitted in November 2022, is provided in **Table 7.2**, along with details of how the comments have been addressed in this chapter.

Table 7.2 Summary of relevant consultation

Consultee	Key issues raised	Actions in response to consultee comments
Planning Inspectorate (PINS) DNS EIA Scoping Direction dated 17 July 2020 (ref. DNS/3253147)	Reptiles – As the presence of common lizard and adder has already been confirmed, the Planning Inspectorate agrees to scope out further formal reptile surveys provided the mitigation, compensation and enhancement measures are robust and appropriate.	Measures relating to mitigation, compensation and enhancement for reptiles are provided in Section 7.8.
PINS DNS EIA Scoping Direction	Great crested newt (GCN) - The Scoping Report states that eDNA presence/absence surveys will be conducted in 2020. The Applicant is reminded that if GCNs are found to be present, a population assessment should be conducted to inform future licences. The correct survey methodology and timing should be followed.	Full surveys, including population surveys have been undertaken for all potentially suitable ponds within 500m, a copy of the report is provided as Technical Appendix 7.5 (Volume 4) .
PINS DNS EIA Scoping Direction	Bats - It is unclear why only five static detectors were employed in 2019 and no transect surveys were undertaken. The Scoping Report states that six different species of bat were detected although bat activity was considered low. This could be due to the use of static detection only on a limited amount of locations. Without further information to justify the survey rationale, it is not possible to exclude that the results may be due to limited survey effort. The Applicant is therefore	Industry-standard guidelines for bats and onshore wind turbines in place at the time of survey (SNH <i>et al.</i> , 2019) advise that bat survey effort is based upon the deployment of static bat detectors at proposed turbine locations where these are known (using one detector per turbine for wind farms containing less than ten proposed turbines). During initial surveys conducted in 2019, five turbines were being considered and this was reflected in the location and number of static detectors used.

Consultee	Key issues raised	Actions in response to consultee comments
	advised to have regards to the full set of survey techniques available, and not just repeat the 2019 survey effort. The ES should include enough information to ensure that the survey effort has been adequate to the conservation value of the site.	Following revisions to the Proposed Scheme, involving up to two additional turbines, further survey was undertaken in 2020 using seven detectors. The guidelines note that the use of additional survey methods, such as walked transects and vantage points is discretionary and site-specific. Based on the 2019 survey results such additional surveys were not considered necessary and the 2020 survey results support this conclusion. Furthermore, there are several health and safety considerations which precluded the implementation of manual nocturnal surveys at this Site evidenced by the damage caused by arson (widespread fire damage in April 2020), theft of bat detectors, general antisocial behaviour noted in the vicinity, the remote nature of the Site with poor emergency access routes, no points of reference and very uneven terrain. Further details regarding the bat survey methodology are provided in Technical Appendix 7.3 (Volume 4).
PINS DNS EIA Scoping Direction	Bats - The Scoping Report does not include information on the risk of collision. The ES should consider the risk of collision as part of the assessment and collision monitoring plans should be presented.	It was not appropriate to carry out an assessment of collision risk at the scoping stage, based on only partial survey data and prior to the scheme design being finalised. The risk of mortality to bats during wind farm operation is assessed in Section 7.6 and post-construction bat monitoring proposals are detailed in Section 7.9.
PINS DNS EIA Scoping Direction and Natural Resources Wales (NRW) – EIA scoping opinion letter dated 03 July 2020	Otters and water voles: Surveys for otters and water voles are proposed. We welcome both and consider it will be particularly important to survey for water voles given the known increased distribution of this species in upland situations in	Surveys have been undertaken as requested and the results are presented in Technical Appendix 7.4 (Volume 4) .

Consultee	Key issues raised	Actions in response to consultee comments
	South Wales identified following from recent survey work. Water vole surveys are best timed for mid-April to end of June, and later in the period July-September. For otters NRW advise surveys are timed throughout the year (e.g. spring, summer, autumn and winter) to be able to assess seasonal variation in use of the site by the species.	
PINS DNS EIA Scoping Direction	The Scoping Report states that changes to survey effort due to the COVID 19 restrictions will be presented in the ES as part of the limitations, if necessary. The Planning Inspectorate recommends that the Applicant discuss possible deviation from guidance in advance with the relevant stakeholders to ensure that the future ES is supported by an adequate level of information.	At the time of preparing the Scoping Report, the full extent of restrictions was unknown. In practice, no significant limitations have occurred upon planned survey effort or approaches as a result of COVID 19.
PINS DNS EIA Scoping Direction and NRW – EIA scoping opinion letter dated 03 July 2020	The Scoping Report states that a high level assessment of the potential effects of the grid connection will be summarised within the ES for the proposed wind farm. Although the Grid connection may be part of a separate consenting process, the potential impacts on ecology and biodiversity during construction should be considered as part of the ES submitted to support this application, as far as possible. A summary may not be sufficient. Any limitation in the information provided should be justified in the ES.	Appropriate consideration to Grid Connection has been presented in Section 7.7. Effects can be reasonably accurately predicted given that most of the likely grid connection route lies within the area surveyed for this EIA, although a full assessment will be required as part of the separate consenting process for the grid connection.

Consultee	Key issues raised	Actions in response to consultee comments
PINS DNS EIA Scoping Direction	The Inspectorate expects the cumulative assessment to consider all projects that may lead to cumulative effects (such as other major energy infrastructure projects) rather than just wind energy schemes. The list of cumulative schemes should be agreed with the relevant consultees.	Consideration has been given to all projects that may lead to cumulative effects, as set out in Chapter 13: Cumulative Effects
PINS DNS EIA Scoping Direction	The Scoping Report states that, following the Phase 1 Habitat assessment conducted in 2019, the majority of the habitat present on site is considered of low conservation value. The Planning Inspectorate understand that the majority of the site comprises two Sites of Importance for Nature Conservation (SINC). Therefore, a comprehensive mitigation plan should be provided in the ES, including details of micro-siting to reduce construction and decommissioning impacts. The Applicant is reminded that the proposed development should include enhancing measures, for example through the implementation of a sustainable grazing regime. This should be presented in the ES, along with a clear system to quantify, where possible, the benefit and gain of the proposals. The ES should also include monitoring provisions (including a collision monitoring plan) and clear indications of triggers which would prompt a change in the management of the site, if necessary.	The mitigation hierarchy has been followed to minimise impacts on important habitats, specifically by seeking to avoid deeper peat, as far as possible. Where unavoidable residual effects remain compensation and enhancement are proposed in an Outline Habitat Management Plan (HMP), provided as Technical Appendix 7.6 (Volume 4). This sets out measures to restore 22.6 ha of heathland habitat on-site and up to 149.3 ha of upland habitats, including modified bog and heathland, off-site in order to compensate for predicted effects upon Site habitats and provide additional biodiversity enhancement. Post-construction bat monitoring proposals are detailed in Section 7.9.

Consultee	Key issues raised	Actions in response to consultee comments
NRW – EIA scoping opinion letter dated 03 July 2020	NRW advise that Phase 1 habitat surveys are undertaken and completed during the summer to ensure the best chance of identifying the habitats present. NRW welcome the approach outlined in Section 6.23 of the Scoping Report to avoid impacts on ‘habitats of potential conservation importance’ through development layout and the acknowledgement that more detailed (Phase 2, NVC) botanical surveys may be required if areas of ecological importance are likely to be affected by the scheme.	Phase 1 habitat surveys were undertaken during the summer months and National Vegetation Classification (NVC) surveys were carried out within areas of potential ecological importance likely to be affected by the Proposed Scheme. Full details are provided in Technical Appendix 7.2 (Volume 4).
NRW – EIA scoping opinion letter dated 03 July 2020	It should be acknowledged that the overall condition of the habitats at the Site could be improved with better management, including changes to grazing practice. Where habitats are currently degraded, their current value and potential value may be of importance to biodiversity objectives and ecosystem and species population resilience. The ecological importance of the development site should be fully assessed as part of the ES along with all opportunities for ecological enhancement.	The importance of the habitats and species present at the Site is evaluated in Section 7.5. An Outline HMP is provided as Technical Appendix 7.6, (Volume 4), to compensate for predicted effects upon Site habitats and provide additional biodiversity enhancement. This sets out measures to restore 22.6 ha of heathland habitat on-site and up to 149.3 ha of upland habitats, including modified bog and heathland, off-site.
NRW – EIA scoping opinion letter dated 03 July 2020	NRW advised the site is subject to assessment to determine the likelihood of protected species being present in the area and likely to be affected by the proposals. Targeted species surveys should be undertaken for all species scoped in and be undertaken by qualified, experienced and where	Targeted surveys have been undertaken with full details set out in Technical Appendices 7.3 (Bats), 7.4 (Otter and water vole) and 7.5 (GCN), Volume 4.

Consultee	Key issues raised	Actions in response to consultee comments
	necessary, licensed ecologist; and, comply with current best practice guidelines. In the event that the surveys deviate from published guidance, or there are good reasons for deviation, full justification for this should be included within the ES.	
NRW – EIA scoping opinion letter dated 03 July 2020	Surveys to assess bat activity across the site were undertaken in 2019 in relation to a 5 turbine scheme, and that due to a revision to the development proposals, surveys in 2020 relating to a 7 turbine development are now proposed. NRW note that 7 static detectors are proposed to be used, we assume to relate to each of the turbine locations. There are some watercourses running across the site, in some instances relatively close to the turbine locations. We therefore advise static detectors are also deployed in the watercourse valleys as, in this open location, those are the areas where bat activity is to be expected, and information should be obtained about the relationship of bat activity in those locations compared to the proposed turbine locations.	The scope and extent of static bat survey follows industry-standard guidelines in relation to onshore wind development in place at the time of survey, of which NRW is a co-author. The guidelines do not advise the deployment of additional detectors in adjacent habitats for schemes containing less than ten turbines and so this was not considered necessary. Full details of the bat surveys undertaken are provided in Technical Appendix 7.3, (Volume 4) .
NRW – EIA scoping opinion letter dated 03 July 2020	NRW note the proposals for presence/absence eDNA surveys. In the event that positive results are obtained, a full suite of traditional surveys, in accordance with published guidance, should be undertaken to establish the size of the population concerned. NRW advise that waterbodies within	A combination of eDNA and traditional surveys have been undertaken for all potentially suitable ponds within 500 m, as set out in Technical Appendix 7.5, (Volume 4) .

Consultee	Key issues raised	Actions in response to consultee comments
	500m of the development site are considered.	
NRW – EIA scoping opinion letter dated 03 July 2020	Otters and water voles: Surveys for otters and water voles are proposed. We welcome both and consider it will be particularly important to survey for water voles given the known increased distribution of this species in upland situations in South Wales identified following from recent survey work. Water vole surveys are best timed for mid-April to end of June, and later in the period July-September. For otters NRW advise surveys are timed throughout the year (e.g., spring, summer, autumn and winter) to be able to assess seasonal variation in use of the site by the species.	Surveys have been undertaken as requested and the results are presented in Technical Appendix 7.4, (Volume 4).
Merthyr Tydfil County Borough Council (MTCBC) – scoping advice letter dated 29 June 2020	Full details of the Phase 1 Habitat Survey would be required in the EIA, including the methodologies and results of the completed surveys, which should concentrate on those areas that will be adversely impacted (directly or indirectly) by the development.	Details of the habitat surveys undertaken are summarised within this chapter, with full details provided in Technical Appendix 7.2, (Volume 4).
MTCBC – scoping advice letter dated 29 June 2020	With respect to the bat surveys, full details should be provided in the EIA and should include, but not be limited to, the following: - Weather conditions during each night that a static bat detector was deployed - Exact dates for static survey work - Height the static detectors were deployed at - No walked transect or vantage point surveys have been detailed. Although the	Full details in relation to survey timings and weather conditions are provided in baseline survey reports (Technical Appendix 7.3, Volume 4). Survey effort has been undertaken in accordance with the relevant guidelines in place at the time of survey, at the timings specified. In relation to additional surveys, such as at height and transect/ vantage point surveys, these are not mandatory under the current guidelines and the results of the static surveys completed do not indicate levels of activity

Consultee	Key issues raised	Actions in response to consultee comments
	'guidelines' say their applicability is discretionary, it is felt that these surveys would be of great use in fully understanding flight lines and the numbers of bats present in the area. Has there been consideration of the additional survey methods detailed in the guidelines (if so, why were they ruled out?) Although bat activity for all species (apart from common pipistrelle) was found to be low following the surveys, the EIA should acknowledge The National Bats and Wind Turbines study which found that some sites with low activity had high bat casualty rates Vulnerability to collision should be considered and the risks (in Wales) taken into account during the assessment. Other considerations – will there be any land use changes on the site? Has the impact on favourable conservation status been considered? What of mitigation, compensation and enhancement? Has turning off turbines at night in the bat activity season been considered to protect bats?	sufficient to justify undertaking such surveys. The guidelines in place at the time of survey note that surveys at-height are unlikely to detect the presence of any species not already recorded using detectors at ground level, except in woodland, which is not present here. As highlighted above, there were also health and safety concerns regarding the ability to undertake nocturnal surveys manually at this Site. Taking these factors into account, it is considered that appropriate survey effort has been achieved, in accordance with current guidelines, to enable accurate assessment of potential effects and conservation status. Potential impacts on bats are assessed in Section 7.8 and post-construction bat monitoring (and, if required, mitigation) proposals are detailed in Section 7.9.
MTCBC – scoping advice letter dated 29 June 2020	eDNA is mentioned in relation to GCN. If presence is established, further survey work to ascertain population sizes should be undertaken. Full details of any other survey work would be required including bat, badger, otter and water vole surveys. Additionally, consideration should be given to the possible	Surveys have been undertaken in relation to badger, bats (Technical Appendix 7.3), otter and water vole (Technical Appendix 7.4) and GCN (Technical Appendix 7.5). GCN surveys included population surveys. Other species and groups are considered in this assessment although formal surveys were not considered necessary in order to

Consultee	Key issues raised	Actions in response to consultee comments
	adverse impacts on invertebrates or taxa such as bryophytes, lichens and fungi.	do so. Although not directly relevant in Wales, in the absence of a specific Welsh alternative, guidance provided by NatureScot on these matters (NatureScot, 2022) is pertinent here. This states that there are some species, including terrestrial invertebrates, amphibians and reptiles, that with standard mitigation are unlikely to experience a significant environmental effect during construction/operation of onshore wind farms. Such species therefore do not require surveys to inform an EIA. Habitats that are potentially the most important areas for bryophytes, lichens and fungi have been identified during the habitat surveys allowing their consideration in the scheme design and assessment.
MTCBC – scoping advice letter dated 29 June 2020	All Avoidance, Mitigation, Compensation and Enhancement measures must be robust and appropriate, following the completion of all relevant survey work, along with a Habitat Management Plan. Notwithstanding the above points, the general scope of the survey work is acceptable.	Mitigation measures are set out in Sections 7.5 and 7.6 and an Outline HMP is provided as Technical Appendix 7.6 (Volume 4) .
MTCBC – scoping advice letter dated 29 June 2020	Whilst data has been sought from SEWBrEC, there may be other sources of information available from the work undertaken in relation to the A465 Dualling Project. Other conservation bodies, such as the Wildlife Trust, The Amphibian and Reptile Conservation Trust, RSPB and the Merthyr Tydfil Biodiversity Partnership may be able to offer local knowledge.	Further investigation of desk-based sources has been undertaken and discussions with local authority ecologists have been held. Relevant data associated with the A465 Dualling Project were not able to be sourced and other conservation bodies were considered unlikely to hold data additional to that provided by SEWBrEC. The results of the desk study are summarised in Section 7.5 of this chapter, with further details provided in Technical Appendix 7.1 (Volume 4) .

Consultee	Key issues raised	Actions in response to consultee comments
Caerphilly County Borough Council (CCBC) – scoping opinion email dated 6 July 2020	Full details of any other survey work would be required. The Applicant should include the following baseline Information: A desk study including a search of designated sites in the vicinity of the site and existing species and habitat data from the South East Wales Biodiversity Records Centre (SEWBRc) and from records held by the CCBC Ecologists. For Statutory Designated Sites and European Protected Species a search within 5 km of the site is required. For Locally Designated Sites, Protected Species and LBAP species, a search within 2 km of the site is required. Extended Phase 1 Habitat Survey. National Vegetation Classification (NVC) Survey. GCN Surveys (relating to breeding and terrestrial habitat). GCN have been recorded in some ponds present on the common. Reptile Survey. Bat Activity and Habitat Survey. Bat Activity Monitoring at Height Survey. Waxcap Survey. The habitat present within and around the site has the potential to support these species. Otter Survey. Otter has been recorded using some of the ponds on the common for feeding. Water Vole Survey. The habitat present on site is suitable for these species.	A desk study has been undertaken through SEWBRc (see Technical Appendix 7.1 for further details), and further consultation has taken place with the CCBC ecologist regarding additional records (see below). Phase 1 Habitat and National Vegetation Classification (NVC) surveys have been undertaken (see Technical Appendix 7.2 for further details). The presence of reptiles was confirmed during initial habitat survey work and it has been possible to design an appropriate mitigation strategy on that basis. Further survey was therefore not considered necessary, as supported by PINS and other consultees and by relevant wind farm-specific guidance (see response to MTCBC comments above). As highlighted in responses to relevant comments from PINS, NRW and MTCBC above, the bat activity survey follows the scope and methods advised in the standard guidelines in place at the time of survey (see Technical Appendix 7.3 for further details). Surveys have been undertaken in relation to badger, bats (Technical Appendix 7.3), otter and water vole (Technical Appendix 7.4) and GCN (Technical Appendix 7.5). Whilst it is acknowledged that waxcap fungi may be present, formal surveys were not considered to be necessary in order to complete the ecological impact assessment on the basis of the proposal directly affecting a relatively small area of the wider habitat mosaic likely to support waxcap fungi (See Section 7.5).

Consultee	Key issues raised	Actions in response to consultee comments
	The potential for other species should be identified in the Extended Phase 1 Habitat Survey and if necessary additional surveys to be undertaken.	
CCBC – scoping opinion email dated 6 July 2020	An assessment of the value of the habitats and species on site together with the value of nearby ecological sites of value.	The importance of the habitats and species present at the Site is evaluated in Section 7.5.
CCBC – scoping opinion email dated 6 July 2020	The Impact Assessment should include the immediate, short term, medium term and long-term impacts on the habitats and species identified during the baseline surveys.	All stages of the Proposed Scheme are assessed in Section 7.5.
CCBC – scoping opinion email dated 6 July 2020	Mitigation, Compensation and Enhancement: Where there is likely to be an impact on European Protected Species the Applicant will need to provide sufficient information to enable the three tests under the Habitats Regulations 2010 to be met, including the consideration of alternative options. Avoidance of impacts should be a priority and where this is not possible, measures to mitigate the impact should be provided that have been agreed by the developer. If proposed mitigation is not sufficient then compensation measures should be provided. Opportunities for enhancement should also be included. Monitoring of any measures put in place are likely to be required.	Any significant effects, in need of a European Protected Species Licence, have been discounted. The mitigation hierarchy has been followed to minimise impacts on important habitats, specifically by seeking to avoid deeper peat, as far as possible. Where unavoidable residual effects still exist further compensation and enhancement are proposed in an Outline Habitat Management Plan (HMP), provided as Technical Appendix 7.6 (Volume 4). This sets out measures to restore 22.6 ha of heathland habitat on-site and up to 149.3 ha of upland habitats, including modified bog and heathland, off-site. Post-construction bat monitoring proposals are detailed in Section 7.9 and post-construction monitoring of restored and managed habitats is also proposed within the Outline HMP (Technical Appendix 7.6 Volume 4).
NRW (further consultation)	Several attempts were made to consult further with NRW, under their	n/a

Consultee	Key issues raised	Actions in response to consultee comments
prior to submission of draft ES in November 2022)	Discretionary Advice Service (DAS), to discuss matters arising in the scoping responses, the impact assessment and mitigation/compensation proposals (letter dated 25 August 2020 and emails dated 24 February 2021, 31 March 2021, 5 May 2021, 6 August 2021 and 7 January 2022). Unfortunately, NRW was unable to respond to these requests due to lack of available resources.	
MTCBC (Online meeting with Matthew Davies (MD), MTCBC Ecologist, on 28 January 2021)	Discussion regarding scheme updates and queries on scoping responses.	Agreed that the scope of survey work set out in the 2020 Scoping Report was acceptable, subject to the appropriate justifications and rationale being set out in the ES. See also actions in response to MTCBC scoping comments above.
CCBC (Online meeting with Maggie Iles, CCBC Principal Ecologist, on 20 April 2021)	Discussion regarding scheme updates and queries on scoping responses.	Agreed that the scope of survey work set out in the 2020 Scoping Report was acceptable, subject to the appropriate justifications and rationale being set out in the ES. See also actions in response to CCBC scoping comments above.
MTCBC (Online meeting with Matthew Davies (MD), MTCBC Ecologist, on 4 October 2022)	Project update provided. Initial discussion held regarding the principle of potentially providing off-site compensation for the loss of peat, and additional biodiversity enhancement, via peatland restoration within the adjacent Bannau Brycheiniog National Park.	Agreed in principle, given the lack of alternatives and subject to agreeing details of the measures proposed, that an approach of providing off-site compensation and enhancement in the National Park would be acceptable. Note that off-site compensation and enhancement in the National Park is no longer proposed (see Section 7.8 and Technical Appendix 7.6, Volume 4).
CCBC (Online meeting with Erica Dixon (ED), CCBC Ecologist, on 6 October 2022)	Project update provided. Initial discussion held regarding the principle of potentially providing off-site compensation for the loss of peat, and additional biodiversity enhancement,	Agreed in principle, given the lack of alternatives and subject to agreeing details of the measures proposed, that an approach of providing off-site compensation and enhancement in the National Park would be acceptable. Note that off-site compensation and

Consultee	Key issues raised	Actions in response to consultee comments
	via peatland restoration within the adjacent Bannau Brycheiniog National Park.	enhancement in the National Park is no longer proposed (see Section 7.8 and Technical Appendix 7.6 Volume 4).
NRW (Statutory pre-application consultation letter dated 21/12/22) (Subsequent discussion regarding NRW Response to Statutory Pre-Application 24/01/23)	Bats NRW stated that the following further information should be provided: For each of the survey years (i.e., 2019 and 2020) a map showing the location of the static detectors in relation to each of the turbine locations now proposed and, where the detectors have not been placed at a turbine location, a justification for their siting and how the data obtained is applicable to the turbine locations. The results of an Ecobat analysis of the data for each bat species at moderate and high risk of collision with wind turbines, for each proposed turbine location, for each season, for the 2019 and 2020 surveys. At the meeting on 24/01/23 NRW noted that their concern regarding the Ecobat analysis is specifically due to an apparent peak in pipistrelle activity in summer 2020.	Proposed turbine locations have changed since the surveys were undertaken, in response to the identification of a range of environmental and technical constraints. Current NatureScot <i>et al.</i>, guidelines only require survey effort to be focused on parts of the site where turbines are likely to be located, noting that proposed turbine locations are often subject to change. The habitat on site is fairly homogenous, and detector locations were in representative locations across the Site. Plans showing the detector locations overlaid on to the turbine layout, for each year of surveys, are provided in Technical Appendix 7.3 (Volume 4). Updates to the Ecobat analysis could not be actioned as Ecobat has been offline for several months (see http://www.ecobat.org.uk/ for further info). Two years of Ecobat data have been analysed for each detector location, and for each species, but were amalgamated across each year, not by season. Current guidance does not specify analysis to be by season, just by location and species. It should be noted also that the apparent peak in pipistrelle activity refers to an average 3.5 bat passes per night, where the rest of the season it was 1 pass per night or less. Activity levels during the peak are therefore still relatively low. Further analysis of the Ecobat data is not likely to alter the current conclusions.
NRW (Statutory pre-application)	Habitat Restoration / Outline HMP	The Outline HMP (Technical Appendix 7.6, Volume 4) has been updated and now includes measures to restore 22.6 ha of

Consultee	Key issues raised	Actions in response to consultee comments
consultation letter dated 21/12/22)	NRW consider the area for heathland restoration and management should be larger, at least 38.7ha, to compensate for both the predicted permanent loss of 10.16ha and the temporary loss of 16.1ha of upland habitat. This is to safeguard against the possibility the temporarily lost habitat might not return to the quality it once was. NRW advise the whole of the site be subject to improved management to mitigate the impacts of the scheme, not just the isolated north-eastern part of the site.	heathland habitat on-site and up to 149.3 ha of additional upland habitats, including modified bog and heathland, off-site to the east. Most of the Site is actively grazed common land, making delivery of habitat enhancements challenging as to rely on a reduction of grazing needs to be agreed with all the commoners.

7.4 Approach to the assessment

- 7.4.1 The ecological evaluation and impact assessment approach used here is based on Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland (“CIEEM guidelines”) (CIEEM, 2022).
- 7.4.2 The assessment scope has been informed by relevant legislation, national and local planning policy and guidance, established best practice and experience, as well as the consultation process.
- 7.4.3 All ecologists that have led survey work and reporting associated with the Ecological Impact Assessment (EclA) are members¹ of CIEEM and follow the Institute’s Code of Professional Conduct when undertaking ecological work.
- 7.4.4 The baseline ecological data were collated by a combination of desk-based study and field survey consistent with current standard methodologies and published good practice guidelines.
- 7.4.5 Ecological Impact Assessment (EclA) seeks to:
- establish baseline conditions and identify important ecological features present (or those which could be present)
 - identify important ecological features which could be impacted by the project
 - identify potential impacts and their significance
 - provide details for mitigation, compensation and enhancements, where required.

¹ Or under application.

Study Area

- 7.4.6 The study area used for the EclA differs according to receptor, as recommended by relevant good practice survey guidance.
- 7.4.7 Habitat surveys were undertaken across the entire ‘developable area’ (the maximum area within which development infrastructure could potentially be located) as defined at the time of survey, plus a 100 m buffer. The great crested newt (GCN) (*Triturus cristatus*) survey included potentially suitable ponds within 500 m of the developable area. Bat surveys were based on the maximum developable area for turbines identified at the time of survey. Survey for otter and water vole has encompassed ponds and watercourses within a minimum buffer of 250 m from proposed infrastructure. Survey area boundaries are shown in the relevant reports within **Technical Appendices 7.2 – 7.5 (Volume 4)**.

Baseline Data Collection Methodologies

- 7.4.8 A desk study was undertaken to collate existing information on the designated sites, habitats and non-avian species in and around the Site and to identify target species for baseline surveys.
- 7.4.9 Primary sources of contextual data from the desk study were as follows:
- South-east Wales Biodiversity Records Centre (SEWBRc) provided data on non-statutory designated sites and protected, priority and other species of conservation concern occurring within a search distance of 2 km from the potential site boundary at the time (this has since been reduced), extended to 10 km in respect of bats. Data were initially requested on 26/06/2019. An updated search was undertaken on 13/09/2022 which was based on the central point of the current Site Boundary to check for any additional or updated protected species records within the relevant buffer zones that may have been submitted in the intervening period.
 - A search for statutory designated areas was undertaken within and up to 10 km of the Site Boundary using the MAGIC Database².
 - Natural Resources Wales website³ and Lle Geo-Portal for Wales⁴ for information relating to Statutory designated sites.

Field Survey Methodology

- 7.4.10 Field surveys were undertaken in relation to habitats, bats, otter, water vole, badger and GCN. Full details of these are provided in **Technical Appendices 7.2 to 7.5** with a summary provided below.

Habitat and Vegetation Surveys

- 7.4.11 A Phase 1 habitat survey (JNCC, 2010) was undertaken across the entire ‘developable area’ (i.e., the maximum area within which development infrastructure

² <https://magic.defra.gov.uk/magicmap.aspx>

³ <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/>

⁴ <https://lle.gov.wales/catalogue?lang=en&c=2007> Note - At the time the data was obtained the Lle Geoportal was used, however this has since been replaced by DataMap Wales.

could potentially be located) as defined at the time of the surveys, plus a 100 m buffer.

- 7.4.12 A National Vegetation Classification (NVC) (Rodwell (ed), 1991 *et seq.*) survey was more targeted, and was undertaken at the proposed infrastructure locations, including micro-siting allowances, plus (except in one instance) land within a 100 m radius of these areas.
- 7.4.13 The Phase 1 habitat survey was initially completed on three separate visits: 10th - 11th July 2019; 12th - 14th August 2020; and 5th May 2021. It was subsequently updated to incorporate the findings of a confirmatory walkover survey on 18th – 19th August 2022 and to reflect more detailed peat depth survey data which were not available at the time of the initial surveys.
- 7.4.14 The NVC Survey was initially completed on 21st and 22nd June 2021, and updated on 18th and 19th August 2022, to reflect changes to the proposed layout since the June 2021 survey.
- 7.4.15 Protected or notable plant species, and plant species listed in Schedule 9 of the WCA 1981 (as amended), such as Japanese knotweed (*Fallopia japonica*), Himalayan balsam (*Impatiens glandulifera*) and giant hogweed (*Heracleum mantegazzianum*) were searched for during the course of the surveys.

Protected Species Surveys

Bat Surveys

- 7.4.16 The survey area was designed to take into account the survey requirements set out in the relevant good practice guidelines in place at the time of survey (SNH *et al.*, 2019). The guidelines require surveys to cover the area within which turbines are likely to be located and a buffer zone of at least 200m plus rotor radius. Bat surveys were conducted within the maximum developable area for turbines, as defined at the time of survey, with static detectors installed at the locations where turbines were proposed at that time.
- 7.4.17 A habitat appraisal for potential bat roost features including trees, buildings, and underground structures was undertaken in May 2019.
- 7.4.18 Bat activity surveys were carried out in 2019 and again in 2020. The 2019 surveys were based on a smaller five turbine scheme initially being considered, prior to the 2020 Scoping Report being submitted. The 2020 Scoping Report was based on a scheme of up to seven turbines and therefore to meet SNH *et al.* (2019) guidelines, which require one detector to be used per turbine for schemes of up to ten turbines, surveys were repeated in 2020. Surveys took place as follows:
 - Static bat detector surveys in 2019 – five static bat detectors (Anabat Express, Titley Scientific) were deployed in spring, summer, and autumn 2019. These detectors were set to record bat activity over a period of ten nights per season.
 - Static bat detector surveys in 2020 – seven full spectrum static bat detectors (Anabat Swift, Titley Scientific) were deployed in spring, summer, and autumn 2020. These detectors were set to record over a period of ten nights per season. In practice a minimum of 15 nights deployment was adopted to enable nights in which weather conditions were unsuitable for bat activity to be discounted from the analysis.

Otter and Water Vole Surveys

- 7.4.19 Otter and water vole surveys were undertaken on all ponds and suitable watercourses within a minimum 250 m buffer of the developable area in accordance with the methods set out in Chanin *et al.* (2003) and Dean *et al.* (2016). The initial surveys were undertaken over two separate visits: 10th June 2020 and 12th August 2020. A further two surveys were carried out, on 2nd December 2020 and 16th February 2021 to specifically search for signs of otter activity.

Badger

- 7.4.20 Badger surveys were conducted in combination with the Phase 1 habitat surveys following the methods set out in Harris *et al.* (1989). Surveys were carried out on three separate visits: 10th – 11th July 2019; 12th – 14th August 2020; and 5th May 2021. The survey area included the entire 'developable area', as defined at the time of the survey, plus a 100 m buffer. Signs of badger were also searched for in combination with the otter and water vole surveys completed on 10th June 2020, 12th August 2020, 2nd December 2020 and 16th February 2021.

Great Crested Newt Surveys

- 7.4.21 GCN surveys were carried out in 2020 and again in 2021, following indeterminate results for some ponds in 2020. The following survey techniques were implemented.
- In 2020, environmental DNA (eDNA) analysis of waterbodies present within the 500 m survey area in accordance with the methods set out in Biggs *et al.* (2014). The eDNA surveys were conducted in order to establish presence, or likely absence of GCN.
 - In 2021, in line with current guidelines (English Nature, 2001), presence/likely absence surveys were conducted over four visits: 30th March 2021, 8th April 2021, 4th May 2021 and 21st May 2021 on all waterbodies subject to eDNA analysis.

Important Ecological Features (Sensitivity of receptor)

- 7.4.22 In accordance with the CIEEM guidelines, only ecological receptors which are considered to be important and likely to be affected by the Proposed Scheme should be subject to detailed assessment. Ecological features can be important for a variety of reasons and the rationale used to identify them is explained here. Importance may relate, for example, to the quality or extent of the habitats within the Site; habitat and/or species rarity; the extent to which such habitats and/or species are threatened throughout their range, or to their rate of decline.
- 7.4.23 Ecological features are considered within a defined geographical context. The following frame of reference (**Table 7.3**) has been used in this case, relying on known/published accounts of distribution and rarity where available, and professional experience.

Table 7.3: Geographical frame of reference used to value ecological features

Geographic frame of reference	Example
International	European
National	Wales
Regional	South Wales
County	Caerphilly County Borough and/or Merthyr Tydfil County Borough
Local	The Pen March Wind Farm Site plus <i>circa</i> 10 km
Site	The Site

- 7.4.24 For designated sites, importance should reflect the geographical context of the designation. For example, a Special Area of Conservation (SAC) would normally be considered internationally important, a SSSI would normally be considered nationally important and a Site of Importance for Nature Conservation (SINC) would be considered of county level importance.
- 7.4.25 In accordance with the CIEEM guidelines the value of habitats has been measured against published selection criteria and other relevant data where available. Examples of relevant criteria includes descriptions of habitats listed on Annex 1 of the Habitats Directive; Local Wildlife Site Selection Criteria; and Habitat Action Plans (HAPs) contained within Local Biodiversity Action Plans.
- 7.4.26 In assigning a level of value to a species, it is necessary to consider its distribution and status, including a consideration of trends based on available historical records. Reference has therefore been made to published lists and criteria where available. Examples of relevant lists and criteria include:
- Species of European conservation importance (as listed on Annex I of the Habitats Directive)
 - Species included on the Section 7 list of species of principal importance in Wales (under the Environment (Wales) Act 2016)
- 7.4.27 For the purposes of this assessment ecological features of local importance or greater and/or subject to legal protection that are potentially subject to effects resulting from the Proposed Scheme have been subject to detailed assessment. Effects on other ecological features are considered unlikely to be significant in legal or policy terms and have therefore been omitted from the assessment process.

Assessing Impact and the Significance of an Effect

- 7.4.28 The ecological impact assessment process involves the following steps:
- Identifying and characterising potential impacts
 - Incorporating measures to avoid and mitigate (reduce) these impacts (primary and additional mitigation measures)
 - Assessing the significance of any likely residual effects assuming that all primary and additional mitigation measures are implemented

- Identifying additional mitigation or appropriate compensation measures to offset likely significant residual effects (if required)
- Identifying opportunities for ecological enhancement

7.4.29 The impact assessment process considers both direct and indirect impacts. Direct impacts are changes that are directly attributable to a defined action, for example, the physical loss of habitat during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through effects on an intermediary ecosystem, process or receptor, for example, the creation of roads which cause hydrological changes, which, in the absence of mitigation, could lead to the drying out of wetland habitats used by protected and/or notable species.

7.4.30 Likely impacts are characterised by the following attributes:

- Positive or negative
- Extent
- Magnitude
- Duration
- Frequency and timing
- Reversibility.

7.4.31 Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure, and functions, as well as its distribution and its typical species within a given geographical area.
- species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

7.4.32 The concept of ecological significance is addressed in the CIEEM guidelines. Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of ecological impact assessment, a 'likely significant ecological effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local and the scale of significance of an effect may or may not be the same as the geographic context in which the feature is considered important.

Avoidance, Mitigation, Compensation and Enhancement

7.4.33 When seeking mitigation or compensation solutions, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation and compensation for effects on a species population significant at a regional scale should ensure no net loss of the population at a regional scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which must be achieved.

- 7.4.34 Where likely significant ecological effects have been identified, the mitigation hierarchy has been applied, as recommended in the CIEEM Guidelines. The mitigation hierarchy sets out a sequential approach beginning with the avoidance of impacts where possible, the application of mitigation measures to minimise unavoidable impacts and then compensation for any remaining impacts. Once avoidance and mitigation measures have been applied residual effects are then identified along with any necessary compensation measures, and incorporation of opportunities for enhancement.
- 7.4.35 The differences between avoidance, mitigation, compensation and enhancement are defined here as follows:
- Avoidance is used where a potential impact has been avoided through changes in scheme design
 - Mitigation is used to refer to measures to reduce or remedy a specific negative impact *in situ*, for example timing restrictions during construction to avoid key periods for certain species
 - Compensation describes measures taken to offset residual effects, that is, where mitigation *in situ* is not possible, for example, creation of new habitats to compensate for habitats lost or effectively lost due to displacement
 - 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

Potential Cumulative Effects

- 7.4.36 Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects can occur where a proposed development results in individually insignificant impacts that, when considered in-combination with impacts of other proposed or permitted plans and projects, can result in significant effects.
- 7.4.37 In accordance with PINS Advice Note 17 (PINS 2022) a long list of existing, approved or proposed development that may contribute to cumulative effects was initially identified through a review of the MTCBC, CCBC, Blaenau Gwent County Borough Council, Powys County Council, Bannau Brycheiniog National Park Authority (BBNPA) and PEDW planning websites. The long list was reviewed and a short list of other developments to be included in the cumulative assessment was subsequently established.
- 7.4.38 For (non-avian) ecological receptors potential cumulative impacts are only likely to be significant for other developments which are directly adjacent and may affect the same habitats, are located within the same hydrological catchment(s) so may be affected by water-borne sedimentation or pollution events or are located within the regular range of more mobile species, e.g., bats. As set out in the 2020 Scoping Report, the short list of other developments for the cumulative assessment was therefore restricted to other development projects within the same hydrological catchments and other wind farms within 10 km. The cumulative assessment is based on consideration of residual effects, assuming that proposed mitigation and compensation measures for other projects are implemented.
- 7.4.39 The significance of potential cumulative effects has been determined using the same method adopted in the assessment of effects for the Proposed Scheme considered

on its own. Cumulative effects are therefore considered likely to be significant if they undermine conservation objectives for important ecological receptors. Cumulative effects can be considered significant at a wide range of scales from international to local. For example, a likely significant cumulative effect on a regional population of a species is likely to be of regional significance.

Limitations of the assessment

- 7.4.40 An ecological study provides only a “snapshot” of the conditions prevailing at the time of survey. Lack of evidence of any species does not necessarily preclude them from being present at a later date.
- 7.4.41 It is recognised that protected species surveys used to inform this assessment were undertaken between 2019 and 2021, with the most recent bat data relating to 2020. Ecological surveys should be reviewed and possibly updated on a regular basis, although the exact timing of updates will be dependent on many factors. These factors include importance (rarity) of the population, scale (significance) of potential impacts and whether there have been any changes to supporting habitats or local populations, that could provide reasonable assumption that pre-existing survey data does not reflect the current status of a particular feature, which may then change a previous conclusion or proposal.
- 7.4.42 To help consider the suitability of existing data sets for use in this assessment, Section 3.5 of the CIEEM guidance identifies that *“In the majority of cases, ecological data are likely to have been collected within one or two years prior to an EclA being written and development activities may take place one or two years after. In these cases, the survey data may represent a reliable indication of the baseline conditions”*.
- 7.4.43 The most recent site visit, an update to the habitat survey, was undertaken in August 2022 and an updated desk study was undertaken in September 2022. The habitat baseline remains comparable in terms of composition and management to when protected species surveys were completed and the most recent data search did not identify any new or additional records that would influence the surveys undertaken.
- 7.4.44 It is proposed to undertake pre-construction surveys, in particular with respect to otter, badger and water vole to check for changes to the baseline for protected species prior to construction commencing.
- 7.4.45 Based on the above, the information collected is considered an appropriate data set to describe the baseline condition and assess the likely impacts of the Proposed Scheme.

Desk Study

- 7.4.46 Desk study data may not be exhaustive, especially in respect of mobile species, and is intended mainly to set a context for the study. It is therefore possible that protected species not identified during the data search could occur within the search area.

Field Surveys

- 7.4.47 The potential for limitations to occur has been considered in relation to specific surveys as reported in **Technical Appendices 7.2 - 7.5**. As would be common to any prolonged survey period over such an extensive site, minor limitations have been

identified and considered in the relevant technical appendix. A summary of the limitations is as follows.

Habitats

- 7.4.48 The survey area is dominated by grassland and moorland habitats typical of South Wales including marshy grassland, acid grassland, heath, flush and degraded bog. As is often the case with these habitats they occur as mosaics within the survey area with diffuse boundaries. The accurate mapping of such habitats is therefore extremely difficult and the habitat maps provided are therefore a best effort to map the habitats present, noting that large areas have necessarily been mapped as mosaics. In addition, a large grass fire was reported across around 20 % of the Site and extending further to the north-east over the Easter bank holiday weekend in 2020 (13-20 April 2020), after the initial Phase 1 survey had been completed. As the habitat survey has been completed in stages (with surveys completed both before and after the fire), the fire has resulted in changes to the habitat classifications in some areas. As these habitats recover from the fire, the dominant vegetation is likely to be subject to a degree of ongoing change and this in turn may result in some changes to the classifications of the habitats present. These changes are not considered to affect the conclusions of the assessment.
- 7.4.49 Due to the long history of human influence over much of the Pen March Wind Farm Site, including grazing, fire, mining etc., and the resulting degradation of the habitats, the NVC classification should be used with caution for describing habitats at this Site.
- 7.4.50 Two areas within the Site boundary, with a total extent of approximately 18 ha, have not been subject to Phase 1 habitat survey, as these were added to the area within the red line Site boundary after the 2019-2021 surveys were completed. These are located at the north-western and southern boundaries of the Site. A further 0.88 ha at the western boundary of the Site was also inaccessible for survey, as shown in **Technical Appendix 7.2**. No infrastructure is to be located within these areas and this is therefore not considered to be a significant omission.

Bats

- 7.4.51 Direct access to land east of the Site Boundary was not possible. As such, the full 250 m buffer from the developable area under consideration at the time of survey could not be accessed here although it was inspected from the boundary and using aerial imagery. This did not identify any obvious potential bat roost sites and is not considered a significant limitation.
- 7.4.52 During each deployment, bat detectors were attached to wooden stakes at locations determined with hand-held GPS units and a photographic record taken to assist with recovery of the detector at the end of the recording period. Due to the upland nature of the Site, there were no features to secure equipment to such as fences or gates, to minimise the risk of damage. This resulted in occasions where grazing animals had knocked over stakes and/or broken the detector microphones, meaning that detectors did not accurately record for the full amount of time.
- 7.4.53 In 2019, on two occasions during the survey season bat detectors were stolen, meaning that in May and October data were only collected from four detectors. Given that additional surveys were undertaken in 2020, to reflect changes to the design being proposed at that time, this is not considered a significant constraint.

- 7.4.54 In 2020, data loss was only an issue during the spring (May) session where detector A1 only recorded for 7 nights, detector A6 for 4 nights and detector A7 for 8 nights. As such, 2020 data analysis is based on an effective 199 nights rather than the planned 210. Such a reduction, in the context of additional data being gathered in 2019, is not considered a significant constraint.
- 7.4.55 As identified above, there are now additional areas within the red line boundary that were added following completion of bat survey work. There is no infrastructure proposed in these locations and their inclusion earlier would not have influenced the approach or scope of bat activity surveys. As such, this is not considered a significant limitation that would affect this assessment.

Great Crested Newt Surveys

- 7.4.56 Bottle trapping was only undertaken when deemed safe and appropriate to do so. Pond PM2 (see **Figure 7.5 in Technical Appendix 7.5, Volume 4**) has a solid substrate base, also ponds were on occasion open for access to grazing animals. At Pond PM2 (Jepson's Pond), it was therefore not considered appropriate to set bottle traps during any of the surveys, and on one occasion the number of bottle traps was reduced at Ponds PM1 and PM3 due to the livestock. This was considered appropriate as there were welfare considerations relating to ensuring the stable siting of each bottle trap for maintenance of air pockets to be utilised by the trapped GCN. All ponds however comprised clear water with low vegetation cover, and therefore a combination of other survey methods was considered sufficient.
- 7.4.57 The weather in April 2021 was uncharacteristically warm with cold nights which continued into early May. In accordance with the guidelines, due to cold overnight temperatures, it was not possible to set bottle traps on the 8th April or 4th May as there were welfare considerations relating to trapped GCN when temperatures fall below 5 °C. As noted above however, all ponds comprised clear water with low vegetation cover, and therefore a combination of other survey methods was considered sufficient,
- 7.4.58 As identified above, there are now additional areas within the red line boundary that were added following completion of great crested newt survey work. There is no infrastructure proposed in these locations and their inclusion earlier would not have influenced the approach or scope of great crested newt surveys. As such, this is not considered a significant limitation that would affect this assessment.

Design basis and assumptions

- 7.4.59 The assessment of effects is based on the information outlined in **Chapter 3: Proposed Scheme**. The Proposed Scheme has undergone a number of design iterations in response to the constraints identified during the baseline environmental studies. With respect to ecology, the following measures were incorporated to avoid or minimise negative effects as far as possible:
- The Proposed Scheme has been designed to avoid areas of peat, particularly areas of deeper peat, as far as possible (see **Chapter 6: Hydrology, Hydrogeology, Geology and Peat** for further details).
 - The Proposed Scheme has also been designed to avoid areas of non-peat-related habitats of conservation importance, such as dry heath.

- A development-free buffer of at least 50 m has been included for all significant watercourses and waterbodies, except where watercourse crossings are required.

Effects Scoped Out

- 7.4.60 In accordance with CIEEM guidelines detailed assessment is only required for Important Ecological Features. These have been defined based on survey work completed and are set out in **Table 7.7**. Potential effects on species of less than local importance are scoped out of detailed assessment because effects are considered unlikely to be significant in legal or policy terms.
- 7.4.61 As set out in the 2020 Scoping Report, and as agreed within the scoping responses and subsequent consultation with relevant consultees (see **Table 7.2**), the following surveys were scoped out of the ecology assessment:
- bat activity (at height and transect) surveys
 - reptile surveys
 - invertebrate surveys
 - fungi (waxcap) surveys
- 7.4.62 The rationale for scoping out these surveys is set out in **Table 7.2** and is not repeated here. Where the relevant species groups are considered likely to represent important ecological features, they have been included in the assessment.

7.5 Existing environment

Desk study data

Designated sites

- 7.5.1 The Site does not contain any statutory ecological designated areas. There are no statutory designated areas with designations specifically relating to ecology within 500 m of the Site Boundary.
- 7.5.2 In total, 16 statutory ecological designated sites are located within 10 km of the Site (SO0815910042), as shown in **Table 7.4**. It should be noted that sites designated for geological reasons are excluded. Further details, including a map showing the location of the statutory designated sites, are provided in **Technical Appendix 7.1 (Volume 4)**.

Table 7.4: Statutory Ecological Designations within 10 km

Designated Area Name	Approximate distance from Site boundary (m)	Reason for designation
Cwm Taf Fechan Woodlands SSSI	1,652	Mixed deciduous woodland associated with underlying limestone.
Cwm Glo a Glyndyrys SSSI	4,645	A mosaic of habitats including woodland, heath and extensive areas of marshy grassland.
Daren Fach SSSI	5,371	A mosaic of calcareous habitats associated with a limestone escarpment and scree.

Designated Area Name	Approximate distance from Site boundary (m)	Reason for designation
Penmoelallt SSSI	5,451	A mixed woodland associated with Carboniferous limestone.
Cefn Y Brithdir SSSI	6,135	Of interest for the dwarf shrub heath communities.
Bannau Brycheiniog SAC and SSSI	6,903 (SSSI) and 9,122 (SAC)	A mosaic of habitats associated with the Old Red Sandstone which includes Arctic-alpine communities, bog, heath and grassland in addition to geological interest.
Mynydd Llangatwg SSSI	7,356	A mosaic of base-rich habitats associated with a limestone cave system which is of special interest for lesser horseshoe bat.
Usk Bat Sites SAC	7,359	In addition to a range of Annex I habitats, the area contains up to 5 % of the UK population of lesser horseshoe bat.
Bryncarnau Grasslands SSSI	7,685	A series of species-rich meadows which include fen meadow.
Caeau Nant Y Groes SSSI	8,083	Of special interest for the species-rich neutral grassland communities.
Cwm Merddog Woodlands SSSI	8,783	An extensive area of beech woodland.
River Usk SAC and River Usk (Tributaries) SSSI	9,210	A linear habitat used as a corridor and migration route by a range of important species.
Tir Mawr A Dderi Hir SSS	9,216	Species-rich neutral and marshy grassland including fen meadow.
River Usk (Upper) SSSI	9,330	A linear habitat used as a corridor and migration route by a range of important species.

7.5.3 No direct effects on any of the statutory sites listed in **Table 7.4** are predicted as no disturbance or works within any of the above statutorily designated sites is required or proposed. Taking the nature of the Proposed Scheme into account, which will not result in any significant effects upon air quality, and the lack of downstream hydrological connections with the Site, there are no foreseen pathways for indirect effects on any of the sites listed in **Table 7.4**.

7.5.4 With specific reference to the Usk Bat Sites SAC, although within 10 km, the SAC is notified in respect of its population of lesser horseshoe bats. No evidence of this species has been recorded within the Site during surveys undertaken in 2019 and 2020. The Site is located more than 2 km from the Usk Bat Sites SAC, the Core Sustainance Zone for lesser horseshoe bat advised by the Bat Conservation Trust, and lesser horseshoe is a low collision risk species in relation to wind turbines (NatureScot *et al.*, 2021). As such, no impact pathways have been identified for this Site.

- 7.5.5 Based on the above and as set out in the 2020 Scoping Report, due to the lack of potential for significant effects, none of the statutorily designated ecological sites described in **Table 7.4** are considered important ecological features and they are therefore not taken forward for detailed assessment.
- 7.5.6 SEWBRc provided records of 13 non-statutory designated sites referred to as Sites of Importance for Nature Conservation (SINCs) within the 2 km buffer. Two SINCs, namely Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC are located within the Site Boundary. Non-statutory sites are summarised in **Table 7.5** and further details, including a map showing site locations, are included in **Technical Appendix 7.1: Desk Study (Volume 4)**.

Table 7.5: Non-Statutory Designated Sites within 2 km

Designated Area Name	Approximate distance from Site boundary (km)	Reason for designation
Pen March and Traed y Milwyr, Llechryd SINC	0 – within Site Boundary	Extensive area of open countryside where semi-natural upland features predominate. Acid grassland, heath and semi-improved acid grassland with at least 7 indicator species for these habitats. Presence of narrow-leaved bur-reed (<i>Sparganium angustifolium</i>).
Merthyr Common North SINC	0 – within Site Boundary	Very extensive area of upland common land supporting a mosaic of both wet and dry moorland habitats. These include extensive areas of unimproved acid grassland, marshy grassland, dry heathland and grass-heath, together with areas of wet heath, acid flush, bracken stands, scree and exposed gritstone bedrock. Tracts of modified blanket bog occur on the highest ground in the north-east of the site; these are often wet with abundant bog-mosses, although sometimes drier where drainage channels have been cut.
Blaenmorlais SINC	Immediately adjacent to the Site Boundary to the south-west	A large area supporting a mosaic of upland habitats at the western edge of Merthyr Common. Mainly acid grasslands with acidic flushes, grass-heaths, dry heathlands, marshy grasslands, bracken slopes and smaller areas of wet heathland and scrub. The site also contains small disused quarries (Garth Quarries) and acid screes.
River Rhymney SINC	0.25 km to the south-east	This SINC comprises the full length of the River Rhymney within the county borough and adjacent semi-natural habitats. This is one of three main watercourses in the county borough and represents a significant linear wildlife corridor. The river and the adjacent semi-natural habitats have been included to incorporate the whole of the river corridor for ecological connectivity purposes.

Designated Area Name	Approximate distance from Site boundary (km)	Reason for designation
Butetown, Llechryd and Rhymney Grasslands, Rhymney SINC	0.42 km to the south-east	Qualifying features include semi-improved acid grassland with at least 7 indicator species, semi-improved neutral grassland with at least 8 indicator species, marshy grassland with at least 12 indicator species.
Pyllau-duon Pond SINC	0.45 km to the north-east	The pond is located on the common land, 2.5 km south-west of Trefil, at an altitude of 490 m. The pond is found amidst the upland communities of acid grassland, dwarf shrub heath and mire. Cefyn Pyllau-duon Pond is found 200 m to the east.
Cefyn Pyllau-duon Pond SINC	0.65 km to the north-east	The pond is located on the common land, 2 km south-west of Trefil, at an altitude of 490 m. The pond is found amidst the upland communities of acid grassland, dwarf shrub heath and mire. Pyllau-duon Pond SINC is found 200 m to the west.
Cefn Gelligaer, West of Deri SINC	1 km to the south-east	Extensive area of open countryside where semi-natural upland features predominate. Designated for acid grassland, heath and semi-improved acid grassland with at least 7 indicator higher plant species, and at least 8 species of waxcap fungi. The SINC has breeding lapwing and locally significant populations of dragonflies.
Tyle Haidd SINC	1.1 km to the north-west	Valley slopes above the Afon Taf Fechan on limestone geology with screes and a disused quarry (Tyle Haidd). Supports unimproved, species-rich, semi-upland calcareous grassland of high biodiversity value, along with calcareous ledge and crevice communities, calcareous scrub woodland, bracken stands and small areas of acid grassland.
Cwm Taf Fechan SINC	1.2 km to the west	The limestone geology gives rise to limestone woodlands, species-rich calcareous grasslands, species-rich neutral grasslands and calcareous scrub. Many species of interest have been recorded from the woodlands which are the designated feature of the SINC. The neutral and calcareous grasslands of the valley slopes and bottom are typically species-rich. Otter ranges along the Afon Taf Fechan, which also supports a range of native fish species including salmon. Nationally rare and scarce invertebrate and bryophyte species have been recorded from the SINC.
Tair Carreg Moor, North West of Fochriw SINC	1.3 km to the south	Qualifying features include extensive area of open countryside where semi-natural upland features predominate, acid grassland, heath

Designated Area Name	Approximate distance from Site boundary (km)	Reason for designation
		and semi-improved acid grassland with at least 7 indicator species for these habitats, presence of <i>Sparganium angustifolium</i> and locally significant populations of dragonflies.
Bryniau SINC	1.4 km to the south-west	Semi-upland site comprising a complex mosaic of many habitats, partly associated with disused quarries (Bryniau Quarries) and spoil tips. Main habitats are acid grasslands with bracken stands, intermixed with numerous areas of acid flush and marshy grassland. Also present are areas of semi-natural woodland, including wet woodland areas dominated by grey willow, neutral grassland, ponds and streams, a small reedbed and some small areas of calcareous grassland. Species of interest include the regionally scarce royal fern and climbing corydalis, along with numerous localised plant species, including heath spotted orchid, southern marsh-orchid, bog asphodel, common milkwort and wild thyme. The ponds of the site support good populations of common amphibian species and great crested newt has also been recorded.
Morlais Hill SINC	1.4 km to the west	Complex semi-upland area of limestone influenced habitats, partly derived from old limestone quarries (Morlais Castle Quarries) and quarry spoil tips. Part of the site is currently in use as a golf course. Extensive calcareous grasslands and screes supporting numerous rare and characteristic species, including the nationally scarce plants mossy saxifrage, soft-leaved sedge and limestone fern, as well as regionally scarce species including limestone bedstraw, brittle bladder-fern, dwarf thistle, common rockrose, common cudweed and green spleenwort. Also includes areas of neutral grassland and some small areas of acid grassland. Other habitats include limestone outcrops with ledge communities, small pools and limestone scrub. Many of the calcareous habitats are of extremely limited occurrence in the county borough. Grayling butterfly occurs in the quarries.

7.5.7 SINC's are considered to be of county level importance and where they are potentially subject to effects resulting from the Proposed Scheme, they are subject to detailed assessment in this chapter. The Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC overlap the Site and are therefore taken forward for assessment in the EclA. Given the separation distances and absence of impact

pathways such as direct habitat loss, air quality effects or direct hydrological connectivity, all other non-statutory designated areas are unlikely to be affected by the Proposed Scheme and are therefore not taken forward for detailed assessment.

Field Survey Results

Habitats

- 7.5.8 A summary of the Phase 1 habitat types recorded within the Site is provided in **Table 7.6** below. It should be noted that other habitat types occur in the wider survey area as set out in **Technical Appendix 7-2 (Volume 4)**.

Table 7.6: Phase 1 Habitats within the Site

Habitat ⁵	Extent within the Site (ha) ⁶
Mosaic: Marshy Grassland, Acid Flush, Wet Heath	228.02
Mosaic: Acid Flush, Wet Heath, Wet Modified Bog	90.24
Marsh/Marshy Grassland	46.36
Semi-Improved Acid Grassland	36.25
Semi-Improved Neutral Grassland	10.57
Rock Exposure / Semi-improved Acid Grassland Mosaic	10.35
Mosaic: Rock Exposure, Dry Heath, Acid Grassland	4.63
Mosaic: Marshy Grassland, Semi-improved Acid Grassland	3.77
Mosaic: Dry Heath, Semi-improved Acid Grassland, Bracken	3.06
Mosaic: Dry Heath, Acid Grassland	3.22
Standing Water	2.20
Mosaic: Rock Exposure, Marshy Grassland	1.83
Semi-Improved Acid Grassland and Scattered Scrub	0.97
Semi-Improved Acid Grassland and Scattered Bracken Mosaic	0.01
Mosaic: Marshy Grassland, Semi-improved Neutral Grassland	0.90
Continuous Bracken	0.56
Marsh/Marshy Grassland and Scattered Scrub	0.47
Fen - Basin Mire	0.09
Bare Ground	0.16
Plantation Mixed Woodland	0.18
Dry Heath	0.07

⁵ Mapped habitats cover an extent of 443.92 ha, the area within the site boundary totals 459.9 ha, this additional unmapped area does not encompass any element of the proposed development.

⁶ Areas differ from those stated with the draft ES, however the habitat areas stated within this document have been confirmed to be correct based on the final red line boundary.

Habitat ⁵	Extent within the Site (ha) ⁶
Flush and Spring - Acid/Neutral Flush	0.01

7.5.9 Most of the habitats present within the survey area have been heavily modified by livestock grazing and/or fire which has reduced the species and sward diversity. Most of the habitats present are relatively species-poor and dominated by common, vigorous plant species that are most resilient to the effects of grazing. Habitats of conservation importance (those listed on Annex I of the Habitats Directive and/or those listed as 'priority habitats' under Section 7 of the Environment (Wales) Act 2016) occurring within the survey area are as follows with the relevant NVC community name in brackets as appropriate:

- Dry heath (H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath)
- Wet heath (M15 *Scirpus cespitosus* – *Erica tetralix* wet heath)
- Wet modified bog (M20 *Eriophorum vaginatum* blanket & raised mire, M17 *Scirpus cespitosus* – *Eriophorum vaginatum* blanket mire and M25 *Molinia caerulea* – *Potentilla erecta* mire)
- Fen-Basin Mire (M4 *Carex rostrata* – *Sphagnum recurvum* mire)
- Acid Flush (M6 *Carex echinata* – *Sphagnum recurvum/auriculatum* mire and M29 *Hypericum elodes* – *Potamogeton polygonifolius* soakway)

7.5.10 The habitats of conservation importance listed above are generally not considered good examples of their habitat type due to the negative effects of grazing and fire within the Site.

7.5.11 Further details regarding the habitats and NVC communities present within and adjacent to the Site, including a Phase 1 habitat map, are provided in **Technical Appendix 7.2 (Volume 4)**. Due to almost all of the area within the Site Boundary occurring within SINC designated for their habitat features, to avoid unnecessary duplication, habitats are taken forward for detailed assessment as part of the relevant SINC designations (see Section 7.6).

Protected and notable plants

7.5.12 The SEWBRc data searches (see **Technical Appendix 7.1, Volume 4** for further details) provided 758 records of vascular plants within the 2 km search area. This included recent (post-2000) records of one protected plant species, namely bluebell (*Hyacinthoides non-scripta*) within the search area. However, none of these records relate to the Site itself.

7.5.13 The SEWBRc data searches also included recent (post-2000) records of the following vascular plant species of conservation concern including mossy saxifrage (*Saxifraga hypnoides*), good-king-henry (*Chenopodium bonus-henricus*), soft-leaved sedge (*Carex montana*), small water-pepper (*Persicaria minor*), charlock (*Sinapis arvensis*), and limestone fern (*Gymnocarpium robertianum*). The records of mossy saxifrage, soft-leaved sedge and limestone fern were generally aggregated around former limestone quarry workings approximately 1 km or more to the west and north-west of the Site. The records of small water-pepper were however located on grazed common land adjacent to the south-western corner of the Site. One bryophyte

species of conservation concern, small-stalk feather moss (*Brachythecium salebrosum*) has also been recorded recently within the 2 km search area. All these species are listed on The Vascular Plant Red Data List for Great Britain.

- 7.5.14 The SEWBRcC data search provided 695 records of locally important plant species, this included a number of orchids such as southern marsh orchid (*Dactylorhiza praetermissa*), bee orchid (*Ophrys apifera*) and pyramidal orchid (*Anacamptis pyramidalis*).
- 7.5.15 No protected or priority plant species were recorded during the Phase 1 or NVC surveys, although the presence of locally notable plant species was noted (see **Technical Appendix 7.2, Volume 4**). Such species are not subject to detailed assessment however, as similar habitats are widespread within the surrounding area and the loss of habitats which may support them is assessed in relation to the relevant SINC designations (see Section 7.6).

Invasive Flora Records

- 7.5.16 SEWBRcC returned 34 records of Invasive Non-Native Species (INNS) within the 2 km search area. These included curley waterweed (*Lagarosiphon major*), Japanese Knotweed (*Fallopia japonica*), Japanese rose (*Rosa rugosa*), montbretia (*Crocsmia pottsii x aurea* = *C. x crocosmiiflora*), New Zealand willowherb (*Epilobium brunnescens*), *Rhododendron ponticum*, wall cotoneaster (*Cotoneaster horizontalis*), heath star moss (*Campylopus introflexus*) and butterfly-bush (*Buddleja davidii*).
- 7.5.17 Records of New Zealand willowherb have been provided within the Site Boundary and records of Japanese knotweed, montbretia, rhododendron and wall cotoneaster are all located along the southern and south-west boundary of the Site in association with Pengarrddu Industrial Estate. Heath star moss and butterfly-bush have both been recorded within Merthyr Common.
- 7.5.18 No INNS were recorded within the Site Boundary during the habitat surveys undertaken. However, Japanese Knotweed was recorded growing within semi-improved neutral grassland within the far south-west of the survey area outside the Site boundary (see **Technical Appendix 7.2, Volume 4**). Given the lack of records within the Site itself, INNS are not taken forward for detailed assessment, however it is proposed to undertake a biosecurity risk assessment and implement appropriate measures during construction, on a precautionary basis, to avoid the possible spread of INNS (see Section 7.6).

Fungi

- 7.5.19 The SEWBRcC data search report included recent (post-2000) records of three fungi species included on the Section 7 list of species of principal importance in Wales (under the Environment (Wales) Act 2016) within the 2 km search area: date waxcap (*Hygrocybe spadicea*); olive earthtongue (*Microglossum olivaceum*); and dark purple earthtongue (*Geoglossum atropurpureum*). There were also records of 22 locally important fungi species.
- 7.5.20 Fungi are not subject to detailed assessment specifically however, as similar habitats are widespread within the surrounding area and the loss of habitats which may support them is assessed in relation to the relevant SINC designations (see Section 7.6).

Bats

- 7.5.21 SEWBRc returned 3,577 records of the following bat species within the 10 km search area; serotine (*Eptesicus serotinus*), Brandt's bat (*Myotis Brandtii*), Daubenton's bat (*Myotis daubentonii*), whiskered bat (*Myotis mystacinus*), Natterer's Bat (*Myotis nattereri*), Leisler's bat (*Nyctalus leisleri*), noctule (*Nyctalus noctula*), Nathusius' pipistrelle (*Pipistrellus nathusii*), common pipistrelle (*P. pipistrellus*), soprano pipistrelle (*P. pygmaeus*), brown long-eared bat (*Plecotus auritus*), greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat.
- 7.5.22 No structures, trees or underground features were identified as having roosting potential within the survey area and the open, upland nature of the Site is considered to provide relatively low value habitat for foraging and commuting bats.
- 7.5.23 Bat activity surveys were undertaken in 2019 and 2020. The automated static bat surveys confirmed the presence of at least six species at the Site, including common pipistrelle, soprano pipistrelle, Myotis bat species (*Myotis* sp.), serotine, noctule, long-eared bat species (*Plecotus* sp.) and 'big bats' (*Nyctalus/Eptesicus*) species.
- 7.5.24 The mean number of bat passes per night, across all detectors and all seasons, for all species combined was 2.25 in 2019 and 2.86 in 2020. Activity was highest in the summer in both years, with a mean of 3.94 bat passes per night in 2019 and a mean of 5.15 bat passes per night in 2020 (all species, all detectors combined). Activity was lowest in autumn in 2019 (mean of 1 bat pass per night for all species, all detectors combined) and lowest in spring in 2020 (mean of 1.17 bat passes per night for all species, all detectors combined).
- 7.5.25 In terms of species abundance, the 2020 survey data followed a comparable pattern to the 2019 data with the majority of passes being attributed to common pipistrelle (67.9 % in 2019 and 63.4 % in 2020), followed by *Myotis* sp. (9.2 % in 2019 and 17.4 % in 2020), soprano pipistrelle (8.9 % in 2019 and 10 % in 2020), noctule (4.8 % in 2019 and 5.3 % in 2020), big bats (1.5 % in 2019 and 2.5 % in 2020), long-eared bat sp. (6.3 % in 2019 and 1.1 % in 2020) and serotine (1.5 % in 2019 and 0.3 % in 2020).
- 7.5.26 It should be considered that *Myotis* sp. and long-eared sp. may be under-represented by virtue of their lower detectability. The low proportion of noctule, serotine and 'big bat' is considered likely to be an accurate representation of activity levels for these species however due to their high detectability.
- 7.5.27 The relative level of bat activity recorded during the static detector surveys was analysed through the use of the secure online tool *Ecobat*. *Ecobat* compares data entered by the user with bat survey information collected from similar areas at the same time of year and (where possible) in comparable weather conditions.
- 7.5.28 In 2020, it was concluded using *Ecobat* that, for species of high collision risk and/or high vulnerability to wind farms, common pipistrelle activity ranged from 'moderate' to 'low' at each recording location, soprano pipistrelle and noctule activity ranged from 'low to moderate' to 'low', serotine activity was 'low' and 'big bat' activity ranged from 'moderate' to 'low'. In 2019, common pipistrelle activity ranged from 'moderate' to 'moderate to high' at each recording location, soprano pipistrelle activity ranged from 'low to moderate' to 'moderate' and noctule, serotine and 'big bat' activity ranged from 'moderate' to 'low'.

- 7.5.29 For any one detector location at Pen March, the reference range provided by *Ecobat* represents a relatively small comparative dataset (1,021 records within 100 km in 2019 and 1,719 records within 100 km in 2020). *Ecobat* outputs should therefore be treated with some caution. In addition, it should be noted that many of these records are likely to have been obtained during surveys undertaken at proposed or operational wind farm site and therefore most of these records are also likely to be from exposed sites with similarly low levels of bat activity. As such it must be considered that the relative level of activity generated by *Ecobat* represents the relative level of activity compared with other similar sites, not the relative level of activity compared with other sites which provide much better habitats for bats. This potentially also helps explain the relatively high occurrence of locations with at least a moderate levels of relative activity, despite the low number of bat passes recorded.
- 7.5.30 It is noted also that *Ecobat* only compares nights when bat activity was recorded. In 2019 72 % of nights recorded no bat activity and in 2020 61 % of nights recorded no activity. This means that the *Ecobat* output potentially overestimates the overall level of bat activity at the Site. Overall, it is therefore concluded that the relative level of activity is therefore better considered to be 'low' or 'low to moderate' for common pipistrelle and 'low' for all other high collision risk and/or high vulnerability bat species.
- 7.5.31 In summary, bat activity across the entire Site was considered relatively low and most likely attributable to individual bats foraging or commuting on occasional nights. The level of activity is considered unlikely to greatly differ from the wider surrounding landscape, however due to its extent the Site is assessed as being of local importance for bats. This, together with their legal protection (all bat species are included on Schedule 2 of the Habitats Regulations and Schedule 5 of the WCA 1981 (as amended)) means that bats are taken forward for detailed assessment.
- 7.5.32 Further information relating to the bat survey work is provided in **Technical Appendix 7.3 (Volume 4)**.

Otter

- 7.5.33 SEWBRc returned four records of European otter (*Lutra lutra*) within the 2 km search area. Two of these records are located with mortality records along the A470. The other two records pertain to otter signs, namely scats, associated with the Rhymney River and Nant Tor-gwyn to the east and west of the Site Boundary respectively.
- 7.5.34 No evidence of otter was recorded during the dedicated otter surveys or any other visits, such as to complete great crested newt surveys.
- 7.5.35 The stream habitats within the Site were considered to be suboptimal for otter, particularly in the summer, due to the generally low water levels and limited foraging opportunities. However, the ponds within the Site were considered to comprise potential year-round foraging opportunities.
- 7.5.36 In view of the above, otter is considered likely absent. Otter is therefore not considered to be an important ecological feature in need of specific assessment however pre-construction surveys and general working practices are proposed in Section 7.6 as a precautionary measure.
- 7.5.37 Further information relating to the otter survey work is provided in **Technical Appendix 7.4 (Volume 4)**.

Water Vole

- 7.5.38 No records were returned by the data search for water vole (*Arvicola amphibious*) within the 2 km search area.
- 7.5.39 No evidence of water vole was recorded during the dedicated surveys or any other visits, such as to complete great crested newt surveys.
- 7.5.40 Whilst there is some suitable habitat for water vole along the watercourses and waterbodies present on-site, this species is concluded likely absent and is not considered further in the assessment.
- 7.5.41 Further information relating to the water vole survey work is provided in **Technical Appendix 7.4 (Volume 4)**.

Badger

- 7.5.42 SEWBRc returned one record of badger within the 2 km search area. This record pertains to a road kill individual on the A465 to the south of the Site Boundary, dating from 2013.
- 7.5.43 No evidence of badger was recorded during the surveys and this species is considered likely absent from the Site and is not considered further in this assessment. However, a precautionary pre-construction survey and general working practices are proposed in Section 7.6.

Amphibians (Great Crested Newt)

- 7.5.44 SEWBRc returned one record of GCN within the 2 km search area. This record pertains to Twyn y Rodyn reclamation pond, to the south of the A465 and south of the Site Boundary, dating from 1986.
- 7.5.45 SEWBRc returned records of common toad (*Bufo bufo*), common frog (*Rana temporaria*) and palmate newt (*Lissotriton helveticus*) within the 2 km search area, including records from within the Site Boundary (Pond PM2, see **Technical Appendix 7.5, Volume 4**), dating from 2017.
- 7.5.46 No evidence of GCN was detected during the surveys, however three other amphibian species were recorded within all of the surveyed ponds, namely common toad, common frog and palmate newt.
- 7.5.47 The habitats within the Site Boundary are unlikely to be more than 'site' level importance to the local amphibian population due to the absence of GCN and the availability of similar or higher quality habitat being widespread and locally abundant. Whilst amphibians are not considered to be an important ecological feature in need of specific assessment, general working practices are proposed in Section 7.6, to be implemented in combination with the proposed reptile mitigation scheme.
- 7.5.48 Further information relating to amphibians, including the great crested newt survey work is provided in **Technical Appendix 7.5 (Volume 4)**.

Reptiles

- 7.5.49 SEWBRc returned two records of reptiles from the 2 km search area, both related to records of common lizard (*Zootoca vivipara*) and were from within the Site Boundary, dating from 2007 and 2009.

- 7.5.50 The Site Boundary is dominated by suitable habitat for common and widespread reptile species. During the Phase 1 habitat survey, and further ecological surveys, both common lizard and adder (*Vipera berus*) have been recorded.
- 7.5.51 As agreed at the scoping stage, dedicated reptile surveys were not undertaken as they would be both impractical on a site of this scale and unlikely to generate any additional data that will affect the conclusions of the assessment. It is considered that the Site is unlikely to be any more than local importance to the local reptile population due to the availability of similar or higher quality habitat being widespread and locally abundant in the wider area. Nevertheless, reptiles are considered an important ecological feature and have been taken forward for detailed assessment.

Invertebrates

- 7.5.52 The data search identified the presence of several invertebrate species recognised as priority species including, but not limited to; grayling (*Hipparchia semele*), small heath (*Coenonympha pamphilus*), wall brown (*Lasiommata megera*), small pearl-bordered fritillary (*Boloria selene*), dingy skipper (*Erynnis tages*), marsh fritillary (*Euphydryas aurinia*), pearl-bordered fritillary (*Boloria euphrosyne*) and cinnabar moth (*Tyria jacobaeae*) within the 2 km search area.
- 7.5.53 The habitats present within the Site Boundary are suitable for a wide range of invertebrate species that are widespread in the locality. Of the above species, grayling, small heath and cinnabar moth have previously been recorded within the Site. Extensive site surveys have not identified any suitable habitat for marsh fritillary, which is the only species listed above which is protected through inclusion on Schedule 5 of the WCA 1981 (as amended), for example *Molinia* fen meadow communities (see SINC citations in **Technical Appendix 7.1**, and habitat survey data in **Technical Appendix 7.2, Volume 4**).
- 7.5.54 Invertebrates are not considered an important ecological feature as the habitats within the Site Boundary are considered to be of no more than site level importance due to their degraded state and the extent at which comparable habitats are present within 5 km.

Invasive Fauna Records

- 7.5.55 SEWBRc returned two records of Invasive Non Native Species (faunal) within the 2 km search area. This includes harlequin ladybird (*Harmonia axyridis*) and signal crayfish (*Pacifastacus leniusculus*). Both records are located beyond the south-western Site Boundary.
- 7.5.56 These species are not assessed as important ecological features in need of specific assessment, however it is proposed to undertake a biosecurity risk assessment and implement appropriate measures during construction, on a precautionary basis, to avoid the possible spread of such species (see Section 7.6).

Evaluation of important ecological features

- 7.5.57 A summary of the important ecological features identified for detailed assessment is provided in **Table 7.7**.

Table 7.7: Important ecological features subject to detailed assessment

Important Ecological Feature	Summary description	Justification
Pen March and Traed y Milwyr, Llechryd SINC (County)	Extensive area of open countryside where semi-natural upland features predominate. Acid grassland, heath and semi-improved acid grassland.	Non-statutory designation at a county level, not formally protected by legislation but planning policy seeks to avoid loss or detrimental impact.
Merthyr Common North SINC (County)	Very extensive area of upland common land supporting a mosaic of both wet and dry moorland habitats.	Non-statutory designation at a county level, not formally protected by legislation but planning policy seeks to avoid loss or detrimental impact.
Habitats (County) (assessed as part of above SINC designations which encompass almost all of the Site).	Habitats of conservation importance include wet heath, dry heath, fen-basin mire, acid flush and wet modified bog.	Includes habitats listed on listed on Annex I of the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and wild fauna and flora) and/or those listed as habitats of principal importance 'priority habitats' under Section 7 of the Environment (Wales) Act 2016.
Bat assemblage (Local)	Comprising at least 6 species for foraging and commuting (common pipistrelle, soprano pipistrelle, Myotis bat species, serotine, noctule, long-eared bat species)	European and UK Protected species. Common pipistrelle, soprano pipistrelle, brown long-eared bat are recognised as species of principal importance under Section 7 of Environment (Wales) Act 2016. Activity levels for all species relatively low and no roost features were identified. Habitats of comparable value are widespread in the immediate surroundings.
Reptile assemblage (Local)	Presence of common lizard and adder identified.	All native reptiles are UK Protected species (common lizard and adder receive partial protection although the level of protection afforded to adder is currently subject to review and may increase) and recognised as species of principal importance under Section 7 of the Environment (Wales) Act 2016. Habitats of comparable value are widespread in the immediate surroundings.

Future baseline (do nothing)

- 7.5.58 Baseline ecological conditions could evolve in the future as a result of changes to current land management practices, as the majority of the Site Boundary is also actively grazed common land there is the potential for changes in management intensity to change. There may also be some changes to the baseline over time as a result of natural variation and weather events.
- 7.5.59 Climate change is also predicted to result in complex changes to biodiversity (NRW, 2021). This may result in changes to the vegetation present or the potential for new species to colonise the Site, which potentially includes non-native species, although the extent of any such changes cannot be accurately predicted at this time. As noted above, part of the Site was subject to a fire during April 2020, such events may also occur more frequently as a result of predicted climate change and, if more frequent, could potentially result in changes to the baseline habitat conditions reported above.
- 7.5.60 The above events and trends have the potential to alter the baseline assessment of the EclA over time. However, in the absence of any detailed, quantifiable information it has been assumed that the baseline conditions will remain largely as they are for the purpose of the assessment and for the predicted timescale that any effects would occur over.

7.6 Assessment of effects

- 7.6.1 This assessment concentrates on the effects of construction, operation and decommissioning of the Proposed Scheme upon the important ecological features identified in **Table 7.7**. The following potential effects have been assessed during the construction phase:
- Habitat loss: Construction of turbine bases, access tracks and other structures, including the substation and battery storage area, would lead to permanent and temporary habitat loss/damage.
 - Sedimentation or other pollution of watercourses: From construction activities and vehicular traffic.
 - Killing or injury of fauna: During construction and initial habitat removal. If protected, this may represent an offence under the relevant legislation.
 - Disturbance/displacement of fauna: During the construction stage of the Proposed Scheme, the potential effects of associated noise and visual disturbance could lead to the temporary displacement or disturbance of faunal species. If protected, this may represent an offence under the relevant legislation.
- 7.6.2 The following potential effects have been assessed during the operational phase:
- Disturbance/displacement: The operation of wind turbines and battery storage, and associated human activities for maintenance purposes, has the potential to cause disturbance and displace fauna. Such effects during the operational phase will be less than during the construction phase, as species are likely to become habituated to wind turbines and disturbance due to human activities would be considerably reduced.
 - Environmental incidents and accidents: Incidents are possible during wind farm maintenance, although the potential for effects will be significantly lower than during construction.

- Mortality of bats: Due to collision with turbines or barotrauma.
- 7.6.3 Effects have been assessed in detail for the following important ecological features in order of importance, refer to **Table 7.7** for justification:
- Pen March and Traed y Milwyr, Llechryd SINC
 - Merthyr Common North SINC
 - bats
 - reptiles
- 7.6.4 Although otter, water vole and badger have been scoped out of detailed assessment, as a precaution further pre-construction surveys and precautionary measures to safeguard these species are proposed to be included in the Construction Environmental Management Plan (CEMP). These are included to address the possibility that protected species may colonise the Site prior to construction commencing. The CEMP would also include a biosecurity risk assessment and appropriate measures to prevent the inadvertent spread of INNS during construction.
- 7.6.5 The assessment of effects is based on the baseline information summarised above and set out in more detail in **Technical Appendices 7.1-7.5 (Volume 4)**; as well as information outlined in **Chapter 6: Hydrology, Hydrogeology, Geology and Peat** and **Chapter 8: Ornithology**.

Potential Construction Stage Effects

Primary and Additional Mitigation and Good Practice Management

- 7.6.6 Full details of construction mitigation measures would be provided in a CEMP. A draft CEMP is included as **Technical Appendix 3.1**. Good practice measures in relation to pollution risk, sediment management and watercourse crossings to be adopted during the construction and operation phases, and further details on peat and water management during construction, are also set out in **Chapter 6: Hydrology, Hydrogeology, Geology and Peat** and **Technical Appendix 6.2: Outline Peat Management Plan (Volume 4)**.
- 7.6.7 Good practice measures, as outlined below, would be employed to avoid inadvertent damage to retained habitats (and impacts on protected or notable species) during the construction phase. Micro-siting of project elements will also be used to avoid areas of more important habitat, or features which could potentially be used by protected or notable species, such as possible refuges for reptiles, where possible.
- 7.6.8 General good practice measures to avoid inadvertent damage to retained habitats would include the erection of temporary protective fencing demarcating the working footprint, to be overseen and policed by the Environmental Clerk of Works (ECoW) (see below). Good practice techniques for vegetation and habitat reinstatement would be adopted and implemented on areas subject to disturbance during construction as soon as is practicable.
- 7.6.9 General good practice measures to protect protected and notable species either known to be present or with the potential to be present, would be implemented during the construction phase, these will include:
- All potentially dangerous substances or materials within the temporary construction compound would be carefully stored to prevent them causing

any harm to otters or other mammal species which may enter the compound at night.

- During construction, all excavations greater than 1 m depth would either be temporarily covered at night or designed to include a ramp to allow reptiles and other animals a means of escape should they fall in.
- A speed limit of no greater than 15 mph would be implemented on-site to reduce the risk of road traffic collisions.

Pre-Construction Surveys

- 7.6.10 Pre-construction surveys for protected species (badger, otter and water vole) will be undertaken during the last available season prior to commencement of construction or enabling works to ensure the likely absence results recorded remain unchanged since the 2020/2021 baseline surveys.
- 7.6.11 Checks for the presence of hedgehogs, polecats, hares or other protected or notable species will also be carried out during the construction phase, immediately prior to vegetation clearance.
- 7.6.12 In the unlikely event that protected species not recorded at the Site previously are identified during the pre-construction surveys and checks, appropriate mitigation measures would be developed and agreed. The nature of any required mitigation would depend on the nature and location of any new protected species records and can not be predicted at this stage, but may involve changes to working practices, timing restrictions or the micro-siting of infrastructure.

Environmental Clerk of Works

- 7.6.13 A suitably qualified ECoW will be employed for the duration of the construction and reinstatement periods, to oversee the safeguarding of important habitats and species and the implementation of ecological mitigation, compensation or enhancement measures, although this may not necessarily be a full-time role throughout. The role of the ECoW would include the following tasks:
 - Give toolbox talks to all staff on-site, so staff are aware of the ecological sensitivities on 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 checks and advise on ecological issues where required
 - Undertake pre-construction inspections of areas which require reptile mitigation (see Section 7.8) and carry out an appropriate level of supervision during vegetation clearance
 - Oversee vegetation and habitat reinstatement on areas subject to disturbance during construction
- 7.6.14 The ECoW would also undertake additional roles, such as advising on drainage and reinstatement, and surveys for nesting birds and establishing/monitoring appropriate exclusion areas (see **Chapter 6: Hydrology, Hydrogeology, Geology and Peat** and **Chapter 8: Ornithology**).

Construction Effects

- 7.6.15 Potential effects, assuming that the good practice mitigation measures outlined above are implemented, are addressed for each important ecological feature in turn.

Habitat Loss

- 7.6.16 Construction of turbine bases, access tracks and other structures would lead to habitat loss, this includes habitat losses for the duration of the development and some that are temporary losses (or damage) during construction.
- 7.6.17 Whilst it is recognised the Proposed Scheme is not a permanent development, for the purpose of this assessment habitat losses associated with wind farm infrastructure are assessed as permanent losses due to the timescales concerned.
- 7.6.18 The Proposed Scheme requires a permanent loss of 9.57 ha (the footprint of all operational infrastructure) and the potential temporary loss or damage (including drainage effects on peatland habitats) to 16.38 ha (the indicative construction working areas shown in **Figure 3.1, Volume 3**).
- 7.6.19 Habitat loss details set out in **Table 7.8** are those that would be lost based on the proposed layout, however it is recognised that subtle differences in the balance of each habitat type lost may occur as a result of micro-siting. No additional habitat types to those shown in **Table 7.8** would be affected as a result of any change to enable micro-siting of infrastructure.
- 7.6.20 In some situations a buffer, typically extending 10 m from all infrastructure, is applied to a proposed layout to calculate potential changes to peatland habitat as a result of changes to hydrology, especially in relation to drying of peat and associated changes in floristic composition. A buffer has not been applied in this instance due to the shallow depth of peat concerned and the habitat survey indicating that peatland habitats are already highly degraded and poorly defined, meaning any changes would be highly localised and difficult to predict with any certainty. In addition, even if some drying did occur, the area affected would be included within the calculations for the area subject to temporary loss/damage so is already accounted for within the habitat loss calculations.
- 7.6.21 As described previously, effects upon habitats all relate to the Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC, due to all proposed infrastructure locations being encompassed by the SINC designated areas. For clarity, **Table 7.8** provides an overall summary of habitat losses in order to demonstrate the overall level of compensation required for the predicted loss of SINC habitats.

Table 7.8: Overall Habitat losses

Habitat type	Permanent loss (ha)	Temporary loss (ha)
Marsh/Marshy Grassland	1.277	1.196
Mosaic: Dry Heath, Acid Grassland	0.328	0.157
Mosaic: Marshy Grassland, Acid Flush, Wet Heath	5.991	11.666

Habitat type	Permanent loss (ha)	Temporary loss (ha)
Mosaic: Rock Exposure, Dry Heath, Acid Grassland	0.002	0.015
Mosaic: Rock Exposure, Marshy Grassland	0.043	0.103
Mosaic: Acid Flush, Wet Heath, Wet Modified Bog	1.499	2.908
Semi-Improved Acid Grassland	0.312	0.085
Semi-Improved Neutral Grassland	0.119	0.22
Rock Exposure / Semi-improved Acid Grassland Mosaic	0.000	0.025

7.6.22 This collectively equates to 9.57 ha of permanent habitat loss which represents approximately 2.1 % of the wider habitat resource associated with the Site Boundary and approximately 1.05 % of combined area of Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC. This is presented on a precautionary basis as this figure includes 5.51 ha for the turbine pad areas which is a worst-case basis.

7.6.23 The predicted temporary loss of habitats (or habitats subject to damage during construction) is 16.38 ha which represents approximately 3.6 % of the wider habitat resource associated with the Site Boundary and approximately 1.8 % of combined area of Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC. Given the degraded nature of the habitats, it is considered likely that habitats subject to temporary loss or damage during construction would revert to their previous state (or similar) within a few years of reinstatement and no significant long-term effects are likely.

7.6.24 Overall, the extent of habitat subject to disturbance, either through permanent loss or on a temporary basis, is 25.95 ha. This represents approximately 5.6 % of the wider habitat resource associated with the Site Boundary and approximately 2.8 % of combined area of Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC.

7.6.25 The effects of the Proposed Scheme upon underlying peat are considered separately in **Chapter 6: Hydrology, Hydrogeology, Geology and Peat**.

Pen March and Traed y Milwyr, Llechryd SINC

7.6.26 As set out above, construction of turbine bases, access tracks and other structures would lead to habitat loss, this includes habitat losses for the duration of the development (assessed as permanent losses) and some that are temporary losses or damage during construction.

7.6.27 The overall extent of disturbance to habitats within the SINC designated area (permanent and temporary) is approximately 21.5 ha. The extent of habitat loss and damage, much of which relates to priority habitat types (albeit degraded examples of them) is assessed as a **likely significant negative effect on a feature of county level importance**.

- 7.6.28 The potential exists for indirect effects to occur as a result of sedimentation or pollution events, for example fuel spillage, occurring during construction. Through the adoption of standard operational controls and primary and additional mitigation proposed as part the construction stage, the likelihood of any such effect is low and any effect upon retained SINC habitats is **not likely to be significant**.

Merthyr Common North SINC

- 7.6.29 As set out above, construction of turbine bases, access tracks and other structures would lead to habitat loss, this includes habitat losses for the duration of the development (assessed as permanent losses) and some that are temporary losses during construction.
- 7.6.30 The overall extent of disturbance to habitats within the SINC designated area (permanent and temporary) is approximately 4.45 ha.
- 7.6.31 The extent of habitat loss and damage, much of which relates to priority habitat types (albeit highly degraded examples of them) is assessed as a **likely significant negative effect on a feature of county level importance**.
- 7.6.32 The potential exists for indirect effects to occur as a result of sedimentation or pollution events, for example fuel spillage, occurring during construction. Through the adoption of standard operational controls and primary and additional mitigation proposed as part the construction stage, the likelihood of any such effect is low and any effect upon retained SINC habitats is **not likely to be significant**.

Bats

- 7.6.33 No buildings, trees or other features with bat roost suitability are proposed for removal as part of the Proposed Scheme as there are none within the Site Boundary.
- 7.6.34 Based on the conclusions of the bat activity surveys undertaken at the Site bat activity associated with the Site was considered relatively low (low to moderate for common pipistrelle). The habitat losses proposed equate to less than 2.1 % of the Site Boundary and are even lower in relation to the retained connected habitats of comparable value associated with Pen March and Merthyr Common. The loss of these habitats is therefore unlikely to significantly affect the foraging or commuting ability of any bat species present such that conservation status could be adversely affected.
- 7.6.35 As construction activity would take place during daylight hours, and no potential roosts occur within 250 m of any area subject to development proposals, no disturbance or displacement of roosting bats is predicted.
- 7.6.36 Based on the above, **no significant effects on bats are likely during the construction phase**.

Reptiles

- 7.6.37 The construction phase would result in the direct, permanent loss of habitats where common lizard and adder may occur, by virtue of habitats which would be lost being comparable to locations where presence has been directly recorded. This relates to approximately 9.57 ha of suitable habitat as set out above.

- 7.6.38 The habitat losses are of a scale that sufficient foraging habitats and opportunities to shelter remain with the Site Boundary such that any reptiles present at any one time under the baseline situation would not be displaced beyond the Site Boundary. During construction, when habitat availability with the Site Boundary would be at its lowest, there would still be approximately 434 ha of comparable habitats within the Site Boundary. Given the Site's elevation, reptiles are likely to be widespread albeit at relatively low density. As such, **the loss of habitat for reptiles is not likely to be significant**. Compensation measures for loss of SINC habitats (see Section 7.8) should also benefit reptiles.
- 7.6.39 In the absence of additional mitigation, construction works have the potential to kill or injure reptiles present when any habitat removal takes place, and potentially result in a decline in the local status of these two species. If this occurred, this is **likely to represent a significant negative effect** on account of the protection afforded to common lizard and adder under the WCA 1981 (as amended). Additional mitigation measures are therefore proposed (see Section 7.8).

Operational effects

Pen March and Traed y Milwyr, Llechryd SINC and Merthyr Common North SINC

- 7.6.40 These SINC are designated for habitat reasons and so the features of interest would not be susceptible to damage or disturbance during the operational stage of the Proposed Scheme.
- 7.6.41 The potential exists for indirect effects to occur as a result of sedimentation or pollution events occurring during operation, for example fuel spillage, although the likelihood of incidents occurring is much lower than during construction. Through the adoption of standard operational controls and primary and additional mitigation proposed as part the construction stage, the likelihood of any such effect is low and any effect upon retained SINC habitats is **not likely to be significant**.

Bats

- 7.6.42 All UK bat species are protected under The Conservation of Habitats and Species Regulations 2017 (as amended). They are also fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).
- 7.6.43 Common and soprano pipistrelle are both classified by current guidelines (NatureScot *et al.*, 2021) as species at high risk of collision, with medium population vulnerability in Wales. Noctule is classified as being at high risk of collision and having high population vulnerability in Wales. Serotine has a medium risk of turbine collision and high population vulnerability in Wales. A small number of bats were recorded during surveys that could not be identified to species were identified as big bats (*Nyctalus/Eptesicus* sp.). Based on other records these are likely to have been either noctule or serotine. These are also considered to have high population vulnerability.
- 7.6.44 Also recorded were long-eared sp. and *Myotis* sp. bats which are considered to have a low risk of collision with turbines.
- 7.6.45 Through a combination of static data analysis and comparison with other data sets (*Ecobat*) it is concluded that the Site has a 'low to moderate' level of relative bat activity for common pipistrelle and a 'low' level of relative activity for the other high

collision risk or high population vulnerability species, soprano pipistrelle, noctule, serotine and *Nyctalus/Eptesicus* sp.

- 7.6.46 The above notwithstanding, there remains a potential for the Proposed Scheme to cause injury/death of individual bats through collision with turbine blades and/or barotrauma (Baerwald *et al.*, 2008; Richardson *et al.*, 2021). However, based on the results of surveys, it is considered the risk of significant negative effects on bat populations during operation is low and unlikely to result in any adverse effect upon the conservation status of any of the species recorded. **No significant effects on bats are therefore likely.**
- 7.6.47 Nonetheless, a precautionary approach has been taken with post-construction bat monitoring proposed to validate the predictions made in the ES and provide the opportunity to introduce mitigation, if deemed to be required based on monitoring results. Further details are provided in Section 7.9.

Aviation Lighting

- 7.6.48 Wind turbines with a height greater than 150 m to blade tip require aviation lighting to comply with CAA requirements in accordance with Article 219 of the UK Air Navigation Order 2016. As such, the Proposed Scheme will need to display visible red lights at night. A detailed Lighting and Marking Plan (LMP) will be agreed with all relevant aviation stakeholders and will set out specific requirements in terms of aviation lighting to be installed on the turbines, as required under CAA (2016) CAP 393, Air Navigation: The Order and the Regulations (2016). Aviation lighting has the potential to attract bats' insect prey species and therefore increase bat activity in the vicinity of the turbines. Some migrating bat species may also be directly attracted to light sources (Bat Conservation Trust and Institution of Lighting Professionals, 2018). If aviation lighting causes bat activity to increase in the vicinity of the turbines, the likelihood of injury/death of individual bats through collision with turbine blades and/or barotrauma would also increase.
- 7.6.49 There is a relative lack of information available on the effects of turbine lighting on bats within Europe, although studies have been conducted in the USA. A five year study undertaken in Texas (Bennett & Hale, 2014) found that there was no significant difference between bat fatalities at turbines with lights and those without lights, although their study was based on turbines with flashing red lights (CAA guidelines require lights in the UK to be non-flashing). Arnett *et al.*, (2008) reviewed findings from 21 post-construction monitoring studies in the USA and Canada and also found no significant difference between bat fatalities with aviation lighting and those without lights. Importantly, one of the studies included in their review found no significant difference in bat fatality between turbines with flashing red beacons and turbines with steady glowing red beacons. In addition, Bruce-White and Shardlow (2011) state that in general insects are most strongly attracted to UV light and are least attracted to red lights. Red-coloured aviation lighting is therefore unlikely to attract significant numbers of insects (and is therefore unlikely to attract significant numbers of foraging bats).
- 7.6.50 Based on the above, and given the relatively low level of bat activity recorded at the Site during the surveys in 2019 and 2020, the risk of significant negative effects on bats as a result of the proposed aviation lighting is low. The conclusion that no significant effects on bats are likely therefore remains unchanged. As noted above,

post-construction bat monitoring is proposed, which would provide the opportunity to introduce mitigation if deemed to be required based on monitoring results. Further details are provided in Section 7.9.

Reptiles

- 7.6.51 **No significant effects upon reptiles are likely during the operational stages** as reptiles would be able to freely move between retained habitats.
- 7.6.52 There is a slight increased risk of killing or injury as a result of operational vehicle movements or increased exposure to predators if reptiles bask on internal roads or hardstanding areas where they interface with retained habitats, but such risks are very small and are not considered to be significant.

Post-Operational Stage Effects (Decommissioning)

- 7.6.53 Potential effects associated with decommissioning of the Proposed Scheme are assumed to be similar, albeit somewhat reduced, to those identified for construction phase (potentially including disturbance but not permanent habitat loss).
- 7.6.54 In the absence of mitigation, decommissioning could cause short term effects through disturbance of protected or notable faunal species. However, good practice measures, similar to those employed during the construction phase, would be implemented. These measures would include surveys prior to decommissioning, to inform an up-to-date assessment of potential effects on protected or notable faunal species during decommissioning. Following the implementation of these measures **no significant effects are anticipated**.

7.7 Grid Connection

- 7.7.1 As set out in **Chapter 3: Proposed Scheme**, the grid connection does not form part of this application, but a high-level assessment has been made based on an assumption of an underground connection to the Dowlais substation, to the south-west of the Site.
- 7.7.2 The grid connection would require additional disturbance of SINC designated habitats and, whilst the exact working area is yet to be confirmed, it is assumed the most likely route would be from the proposed substation location in a broadly south-western direction. This would avoid any further effects upon Pen March and Traed y Milwyr, Llechryd SINC but would be likely to require disturbance and temporary loss of habitats within Merthyr Common North SINC. Any habitat loss to enable grid connection is assumed to be temporary, reversible and guided by an ECoW such that significant effects, such as disturbance of more sensitive/higher value vegetation types, could be avoided.
- 7.7.3 Effects on protected or notable species are possible during the construction of the grid connection, particularly if it takes place during the months in which species are most vulnerable, such as during the reptile active or hibernating season, and mammal breeding season. No protected mammal species were recorded in the vicinity of the likely grid connection route during the surveys undertaken in 2019 and 2020, although habitats are potentially suitable for common lizard and adder. Provided that standard good practice mitigation measures, similar to those proposed for the Proposed Scheme (see paragraphs 7.6.6 to 7.6.14 and Section 7.8), are implemented to avoid

killing and injuring protected species, no significant effects on protected or notable species are anticipated as part of the construction of the grid connection.

- 7.7.4 It is assumed that the grid connection will be underground and therefore no effects are likely during the operational period.
- 7.7.5 It is assumed that cables would be left in the ground on decommissioning of the wind farm and no effects on habitats or faunal species are therefore anticipated during decommissioning.

7.8 Additional Mitigation, Compensation and Enhancement

Pen March and Traed y Milwyr, Llechryd SINC

- 7.8.1 No further mitigation measures, additional to the primary and additional mitigation measures set out in paragraphs 7.6.6 to 7.6.14, are considered necessary during the construction or decommissioning stages.

Outline Habitat Management Plan

- 7.8.2 Compensation for the loss of habitats within the Site, and additional biodiversity enhancement, would be provided via the restoration and management of a range of upland habitats, including the priority habitats modified bog and heathland via a Habitat Management Plan (HMP) (see **Technical Appendix 7.6: Outline HMP** for further details). Although the HMP is specifically targeted at habitats, in time (within a few years) the restored habitats have the potential to improve habitat quality for a range of flora and faunal species, such as reptiles.
- 7.8.3 The HMP seeks to undertake restoration and management activities over an area of up to 171.9 ha, which is located outside the Gelligaer and Merthyr Common and therefore providing an opportunity to control grazing and other management. With respect to non-avian ecology (the Outline HMP also includes measures targeted at breeding waders – see **Chapter 8: Ornithology**), this comprises two elements:
 - On-site:
 - Undertake restoration and management activities over an area of 22.6 ha that should in time lead to increased cover of dwarf shrubs and other heathland plant species and facilitate the area's recovery back to upland heathland.
 - Off-site:
 - Undertake restoration and management activities over an area of up to 149.3 ha, containing a range of upland habitats, that should lead to a significant increase in the extent and quality of priority habitats including modified bog and heathland.
- 7.8.4 This will be achieved, in summary, by the following commitments to ecological led management:
 - Initial restoration via control of purple moor-grass (*Molinia caerulea*) and other dominant grass or rush species (through repeated cutting, herbicide treatment or controlled grazing)
 - Blocking of ditches and drains within peatland areas to raise the water table in the adjacent peat

- Ongoing management via controlled grazing (or cutting if grazing is not possible)
- Heather seeding (if required)

Merthyr Common North SINC

- 7.8.5 The measures set out above in relation to Pen March and Traed y Milwyr, Llechryd SINC would also address effects upon Merthyr Common North SINC.

Bats

- 7.8.6 No mitigation measures for bats are considered necessary during the construction or decommissioning stages.
- 7.8.7 In order to reduce the risk of bat casualties during wind farm operation, feathering will be implemented on all turbines throughout wind farm operation. Feathering refers to the reduction of rotation speed while the turbine is idling (based on the findings of Arnett *et al.* (2013)). In respect of feathering the NatureScot *et al.* (2021) guidelines state: *‘The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50%. As this option does not result in any loss of output, as best practice, it is recommended wherever it is practically possible and there remains uncertainty over the risk posed to bats. It can be applied at any site with a blade pitch control system which can be automated using SCADA data.’* The implementation of feathering should therefore significantly reduce the risk of bat fatalities.
- 7.8.8 The need for further mitigation measures during wind farm operation and, if required, the turbines which would be affected would be discussed and agreed with relevant stakeholders following consideration of monitoring results (see Section 7.9).
- 7.8.9 Worldwide, the majority of mitigation at wind farms to date has involved the use of curtailment of wind turbines. This would therefore form the basis for further mitigation at Pen March Wind Farm, if required. The relevance of curtailment as a form of mitigation is based on a study described in Baerwald *et al.* (2009), during which they showed that increasing the cut-in speed at which a wind turbine operates from 3.5 m/s to 5.5 m/s can significantly reduce bat mortality in areas where a high bat mortality rate would normally occur. Further to this, Arnett *et al.* (2009) suggests that there is no significant difference in bat mortality between a cut-in speed of 5 m/s and 6.5 m/s and the implementation of a 5 m/s cut-in speed was predicted to reduce casualties (of all bat species) by approximately 50 %. NatureScot *et al.* (2021) guidelines endorse curtailment; yet, also recommend that curtailment is restricted to times and weather conditions when bats are at high risk of collision. To minimise down time, NatureScot *et al.* (2021) note that site-specific threshold values at which turbine curtailment is employed should be determined, informed by bat activity at that location. The precise details of any curtailment, if required, would therefore be determined at a later date based on post-construction monitoring data.

Reptiles

- 7.8.10 The commonly occurring reptile species are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) in respect of part of sub-section 9(1) and all of sub-section 9(5) only. As such, it is an offence to intentionally kill, injure or trade these species. It is recognised that the level of protection added received is

currently subject to review, however at this stage this is unlikely to affect the proposed approach set out below but would be reviewed if required.

- 7.8.11 The presence of common lizard and adder has been confirmed. To avoid contravention of the legislation, any site clearance (vegetation removal) would ideally commence within the active period for reptiles (March to October inclusive) although it is recognised due to other considerations, such as breeding birds, that removal may need to take place at other times of year. During vegetation removal, habitat manipulation and ecological supervision would be undertaken to encourage reptiles away from areas of suitable habitat within the construction footprint, and towards retained habitats. This would be achieved using the following steps:
- The area of vegetation requiring removal would first be subject to a habitat assessment by a suitably experienced ecologist
 - The vegetation would then be cut in a staged and directional manner, under an ecological watching brief
 - Any brash, or suitable features for refuge, would be dismantled by hand
 - If any reptiles are found during the above works, they would be carefully moved to a safe place well away from the working area by the ECoW should they not disperse naturally.
- 7.8.12 Following this, searches of potential remaining refugia/hibernacula features would be subject to a final check and be dismantled by hand if required.
- 7.8.13 If vegetation clearance during the winter months is unavoidable, clearance would take place as described above with any suitable features for refuge searched by the ECoW prior to their removal. If any reptiles are found, they would only be moved during suitable weather conditions and would not be moved when in a state of torpor.
- 7.8.14 Implementing the above measures is considered a sufficient basis to avoid killing or injury and maintain the current population level and distribution of reptiles such that there is no detrimental impact or significant residual effect.
- 7.8.15 Whilst formal mitigation for amphibians is not proposed or required, the above measures would also provide a benefit for any amphibians present by minimising the potential for killing or injury.
- 7.8.16 Habitat for reptiles will be enhanced as part of the Habitat Management Plan (HMP). Although the HMP is specifically targeted at habitats, in time (within a few years) the restored habitats have the potential to improve habitat quality for a range of other fauna including reptiles.

7.9 Monitoring

Post-construction Bat Monitoring

- 7.9.1 The proposed monitoring strategy has been broken down in to three phases:
- Phase 1 – updated baseline monitoring of bat activity, prior to wind farm operation
 - Phase 2 – monitoring of bat activity during wind farm operation, to initially be undertaken in years one to three post construction
 - Phase 3 – collision monitoring, which would only be enacted if required, based on the results of post-construction bat activity monitoring

- 7.9.2 Phase 1 would aim to establish an updated baseline against which to assess any future changes in bat activity post-construction. Baseline monitoring would take place in accordance with current NatureScot *et al.* (2021) guidelines and would involve the use of six static bat detectors, stationed at ground level at each turbine location. Recording would take place at each location over a minimum 10-night period in each of spring, summer and autumn.
- 7.9.3 Post-construction bat activity monitoring would start in year one of wind farm operation and would take place annually for the first three years of operation. The need for further monitoring would be reviewed at the end of year three. Post-construction bat activity monitoring would involve collection of bat activity data at ground-level, at the same locations, using the same methods and over similar timescales as the baseline monitoring undertaken during Phase 1.
- 7.9.4 Phase 3 would only be implemented if Phase 2 indicates that the wind farm could potentially be having a significant effect on bats, for example if significant increases in activity of bat species at high risk of collision are identified compared with baseline monitoring data. If required, collision monitoring would be specifically targeted at areas where potentially significant effects are considered most likely (as identified during bat activity monitoring).
- 7.9.5 Monitoring to detect bat carcasses, in sample locations across the site, using specially trained search dogs is widely accepted to be the most effective way of detecting casualties (Mathews *et al.*, 2013; NatureScot *et al.*, 2021) at this time. However, due to the rapidity with which technology is progressing, it is possible that new, more effective methods for monitoring collision risk will emerge in the meantime. The precise methodology to be used, if collision monitoring is required, would therefore be determined nearer the time.
- 7.9.6 The results of collision monitoring, if required, would be used to inform the need for mitigation and (if required) the development of detailed mitigation proposals.
- 7.9.7 Further details would be provided in a bat monitoring and mitigation strategy to be produced and agreed with MTCBC and CCBC post consent.

Outline Habitat Management Plan

- 7.9.8 The management interventions set out in the Outline HMP would be accompanied by botanical monitoring, and hydrological monitoring within peatland areas subject to ditch blocking, over a minimum 10-year period (see **Technical Appendix 7.6, Volume 4** for further details).

7.10 Summary of effects

Habitat loss, including SINC designated land

Construction effects

- 7.10.1 Effects of habitat loss (permanent and temporary) were assessed for habitats, including habitats forming part of the Pen March and Traed y Milwyr, Llechryd and Merthyr Common North SINC. **A likely significant negative effect on a feature of county importance** has been predicted for both SINC.

7.10.2 Compensation for the loss of SINC designated habitats, and additional biodiversity enhancement, would be provided via the restoration of upland habitats, including heathland and modified bog via the Habitat Management Plan (HMP) (see **Technical Appendix 7.6: Outline HMP, Volume 4** for further details).

7.10.3 Whilst implementing the HMP will not remove the significant negative effect, it will offset this by providing **a likely significant positive effect at a County level**.

Operational effects

7.10.4 No areas of fragmentation or isolation were identified and therefore connectivity across the wider Site Boundary and surrounding landscape shall be maintained.

7.10.5 No significant effects are predicted upon retained habitats during the operational stage. As such, no specific mitigation, compensation or enhancement is proposed, and **no significant residual effects are likely**.

Sedimentation or other pollution of watercourses

Construction effects

7.10.6 **No significant effects are likely** during construction following the implementation of the primary and additional mitigation measures.

Operational effects

7.10.7 **No significant effects are likely** during operation following the implementation of primary and additional mitigation measures.

Killing or injury of fauna

Construction effects

7.10.8 Following the implementation of primary and additional mitigation measures, which include update surveys and an ECoW, plus the additional mitigation measures for reptiles during habitat removal, **no significant residual negative effects are likely** during the construction phase.

Operational effects

7.10.9 Following the implementation of additional mitigation measures, the need for and extent of which would depend on the results of proposed monitoring for bats, **no significant residual negative effects are likely** during the operational phase.

Disturbance or displacement of fauna

7.10.10 No significant effects have been predicted in relation to any species or group present, as such **no significant effects are likely** during construction or operation.

Post-Operational Stage Effects (Decommissioning)

- 7.10.11 Good practice measures, similar to those employed during the construction phase, including surveys prior to decommissioning, to inform an up-to-date assessment of potential effects, would be implemented during decommissioning. Following the implementation of these measures **no significant effects are likely**.

7.11 References

- Arnett, E., Brown, W. K., Erickson, W.P., Fiedler, J.K., Hamilton, B.L., Henry, T.H., Jain, A., Johnson, G.D., Kerns, J., Koford, R.R., Nicholson, C.P., O'Connell, T.J., Piorkowski, M.D. and Tankersley, R.D. (2008). Patterns of Bat Fatalities at Wind Energy Facilities in North America. *The Journal of Wildlife Management* **72**(1), pp 61-78.
- Arnett, E., Schrimmacher, M., Huso, M. & Hayes, J. P. (2009) *Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities*. Bats and Wind Energy Cooperative and the Pennsylvania Game Commission.
- Arnett, E. B., Johnson, G. D., Erickson, W. P. & Hein, C.S. (2013). *A Synthesis of Operational Mitigation Studies to Reduce Bat Fatalities at Wind Energy Facilities in North America*. The National Renewable Energy Laboratory, U.S.
- Axis. (2014). *Cruglwyn Wind Turbine Environmental Statement. Volume 3 Non-Technical Summary*.
- Baerwald, E. F., D'Amours, G. H., Baerwald, B. J. & Barclay, R. M. R. (2008). Barotrauma is a significant cause of bat fatalities at wind farms. *Current Biology* **18**(16): R695-6.
- Baerwald, E.F., Edworthy, J., Holder, M. and Barclay, R.M.R. (2009). A Large-Scale Mitigation Experiment to Reduce Bat Fatalities at Wind Energy Facilities. *Journal of Wildlife Management* **73**: 1077-1081.
- Bat Conservation Trust and Institution of Lighting Professionals. (2018). *Bats and artificial lighting in the UK*. Guidance Note 08/18, Bats and the Built Environment series.
- Bennett, V.J and Hale, A.M. (2014). Red aviation lights on wind turbines do not increase bat–turbine collisions. *Animal Conservation* **17** pp 354–358.
- Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F. (2014). 'Analytical and methodological development for improved surveillance of the Great Crested Newt', in Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA.
- Blaenau Gwent County Borough Council. (2021). *Planning Applications Report C/2020/0301, Unit 19, Rassau Ind Est, Rassau, Ebbw Vale*.
- Brooks Ecological. (2015). *Ecological Appraisal Cefn Bach Farm, Deri, Caerphilly*. Report reference: R-1974-01.2, February 2015.
- Bruce-White, C. and Shardlow, M. (2011). *A review of the impact of artificial light on invertebrates*. Buglife – The Invertebrate Conservation Trust.
- Chanin P. (2003) *Monitoring the Otter Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No.10 English Nature, Peterborough.
- CIEEM (2022) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Version 1.2 – Updated April 2022. Chartered Institute of Ecology and Environmental Management, Winchester.
- Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). *The Water Vole Mitigation Handbook (the Mammal Society Mitigation Guidance Series)*. Eds Fiona Mathews and Paul Chanin. The Mammal Society: London.
- English Nature. (2001). *Great Crested Newt Mitigation Guidelines*. Version: August 2001.

- Harris, S, Cresswell, P and Jeffries, D, (1989). *Surveying Badgers* (Volume 9, Occasional Publication). Mammal Society.
- JNCC, (2010), *Handbook for Phase 1 habitat survey – a technique for environmental audit*, JNCC, Peterborough, ISBN 0 86139 636 7.
- Matthews, F., Swindells, M., Goodhead, R., August, T. A., Hardmann, P., Linton, D.M. & Hosken, D.J. (2013). Effectiveness of search dogs compared with human observers in locating bat carcasses at wind-turbine sites: A blinded randomized trial. *Wind Energy and Wildlife Conservation*. Wildlife Society Bulletin.
- NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter & Bat Conservation Trust (2021) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*. Updated revision. NatureScot. Available online: <https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation>
- NatureScot. 2022. *General pre-application and scoping advice for onshore wind farms, August 2022*. Available at: <https://www.nature.scot/doc/general-pre-application-and-scoping-advice-onshore-wind-farms#:~:text=General%20pre-application%20and%20scoping%20advice%20for%20onshore%20wind,General%20advice%20to%20help%20inform%20the%20EIA%20>
- PINS (2022). Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects. Available from <https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/#2>
- Richardson, S.M., Lintott, P.R., Hosken, D.J. et al. Peaks in bat activity at turbines and the implications for mitigating the impact of wind energy developments on bats. *Sci Rep* **11**, 3636 (2021). <https://doi.org/10.1038/s41598-021-82014-9>
- Rodwell, J.S. (ed.) 1991. *British Plant Communities. Volume 2. Mires and heaths*. Cambridge University Press.
- Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter & Bat Conservation Trust (2019) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*.
- Simon Geary Ecology Services Limited. (2015). *Penybreol Farm Wind Turbine Bat and Bird Survey Report*.
- Welsh Government. (2017). *A465 Heads of the Valleys Sections 5 and 6: Dowlais Top to Hirwaun. Environmental Statement Volume 1: Main Text – July 2017*.