

8 ORNITHOLOGY

8.1 Introduction

- 8.1.1 This chapter describes and evaluates the current avian interest of the Site and the surrounding area. It assesses the potential effects of the proposed Pen March Wind Farm (the 'Proposed Scheme') on important bird species and, where necessary, describes proposed mitigation, compensation and enhancement measures. This chapter considers avian species only. Potential effects on habitats and non-avian animal species are considered separately in **Chapter 7: Ecology**.
- 8.1.2 This chapter is supported by a number of technical appendices which can be found in **Volume 4**, as follows:
- **Technical Appendix 8.1: Breeding bird survey report 2019**
 - **Technical Appendix 8.2: Non-breeding bird report 2019-2020**
 - **Technical Appendix 8.3: Breeding bird survey report 2020**
 - **Technical Appendix 8.4: Non-breeding bird report 2020-2021**
 - **Technical Appendix 8.5: Avian collision risk modelling**
 - **Technical Appendix 8.6: Avian confidential appendix**
 - **Technical Appendix 7.6: Outline Habitat Management Plan (June 2023 Update)**
- 8.1.3 Environmentally sensitive information, such as nesting locations for Schedule 1 bird species, is provided in **Technical Appendix 8.6**.

8.2 Statutory and planning context

- 8.2.1 The assessment has been carried out with reference to the legislation, policy and guidance detailed in **Table 8.1**. The list of guidance is not exhaustive and other relevant guidance documents are referred to in this chapter as appropriate.

Table 8.1: Legislation and guidance relevant to Ornithology

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).
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 for bird species is set out in Section 1 of the Act. Bird species subject to special protection are listed under Schedule 1 of the Act.
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. The Section 7 list includes 44 bird species.
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.

Document	Summary
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. Planning policy topics cover 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).
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.
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 (ENW 1 and ENW2).
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.

Document	Summary
CCB Biodiversity Action Plan	The overall aim of the Caerphilly Biodiversity Partnership is: To actively protect, conserve and enhance the biodiversity of Caerphilly County Borough on a continuing basis. The Caerphilly Biodiversity Action Plan 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] Caerphilly County Borough Biodiversity Action Plan Volume 2 details the individual species action plans, which include plans for 24 bird 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	

Document	Summary
Band, W., Madders, M. and Whitfield, D.P. (2007) Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farms.	Collision risk modelling methodology.
Chartered Institute of Ecology and Environmental Management (CIEEM) (2022) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine.	Guidance for the ecological impact assessment process.
Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). Raptors: a field guide to survey and monitoring (3rd Edition).	This guidance outlines the survey techniques that should be employed to successfully survey each of the raptor species regularly occurring in Britain.
Scottish Natural Heritage (SNH) (now NatureScot) (2016a). Assessing Connectivity with Special Protection Areas (SPAs);	Provides core foraging distances for species during the breeding season.
SNH (now NatureScot) (2016b). Environmental Statements and Annexes of Environmentally Sensitive Bird Information	Provides guidance on how to include sensitive bird information in publicly available documents.
SNH (now NatureScot) (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms.	Sets out the industry standard for vantage point survey methodology and other survey methods. Following this technical guidance provides robust data which can be widely interpreted and enables collision risk modelling analysis. In the absence of a specific Welsh alternative this guidance is also applicable to Wales.
SNH (now NatureScot) (2018a). Assessing Significance of Impacts from Onshore Wind Farms on Birds Outwith Designated Areas, Version 2	Provides a framework for assessing impacts on bird populations within environmental statements.

Document	Summary
SNH (now NatureScot) (2018b). Assessing the Cumulative Impact of Onshore Wind Energy Developments	Provides guidance on assessing the cumulative impact of onshore wind developments.
Goodship & Furness (2022) NS Research Report 1283 - Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species	A recent update to the source below, providing sensitivity to disturbance and suggested buffer zones for individual species.
Ruddock and Whitfield (2007). A Review of Disturbance Distances in Selected Bird Species	Providing species specific buffer zones to prevent disturbance during the relevant different seasons.

8.3 Consultation undertaken

- 8.3.1 A summary of the key points from the 2020 Scoping Direction, relevant scoping responses, and other consultations with relevant organisations is provided in **Table 8.2**, along with details of how the comments have been addressed in this chapter.

Table 8.2: Summary of relevant consultation

Consultee	Key issues raised	Actions in response to consultee comments
Planning Inspectorate (PINS) & Natural Resources Wales (NRW) (2020 Scoping Direction)	The 2020 Scoping Report states that Year 2 breeding bird surveys will be carried out in 2020 but does not include wintering and migration surveys for 2020.	A second year of non-breeding surveys was undertaken, commencing in September 2020 and continuing until March 2021 (see Technical Appendix 8.4, Volume 4).

Consultee	Key issues raised	Actions in response to consultee comments
PINS (2020 Scoping Direction)	Targeted specific nocturnal species surveys should be included.	Current NatureScot guidance states that breeding survey should be undertaken for nocturnal species within 500 m of proposed turbine locations for non-owl species (nightjar <i>Caprimulgus europaeus</i>) and 1 km for owls. Suitable habitat for nightjar includes lowland heath and young conifer plantations. There is no suitable habitat for nightjar within 500 m of the proposed turbines. There is no suitable habitat for breeding long-eared owl <i>Asio otus</i> (coniferous woodland) or barn owl <i>Tyto alba</i> (built structures or old trees containing suitable cavities) within 1 km of the proposed turbines. On the basis of the above, survey for breeding nocturnal species is not considered necessary.

Consultee	Key issues raised	Actions in response to consultee comments
PINS & NRW (2020 Scoping Direction and scoping response dated 3 July 2020)	NRW advised that there is evidence that gulls from breeding colonies at Flat Holm and Steep Holm SSSIs forage as far inland as the application area. The Flat Holm and Steep Holm breeding colonies lie within the Severn Estuary Ramsar site, with the breeding lesser black-backed gull population being a designated feature. Therefore, NRW advised that further consideration of the Flat Holm and Steep Holm SSSI and the Severn Estuary Ramsar conservation objectives was necessary, and should be addressed within the ES even if outside the 10 km search area.	Gulls were recorded as secondary species during breeding and non-breeding vantage point (VP) surveys. In accordance with current NatureScot guidance this means that a summary of observations was recorded at the end of each five-minute period during VP watches to provide an index of flight activity within the Site. During breeding surveys in 2019 and 2020, lesser black-backed gull was recorded during only 5 % of five-minute recording periods in both years with a peak count of six and 45 birds respectively (see Technical Appendices 8.1 and 8.3, Volume 4). Furthermore, lesser black-backed gulls were noted to be breeding on factory roofs to the south of the A465 and most of the activity that was recorded concerned gulls moving between the factories and the water bodies in the south of the Site Boundary, outside the developable area for turbines. On the basis of the above, significant effects on the Flat Holm and Steep Holm SSSI and Severn Estuary Ramsar lesser black-backed gull populations are not likely and are not considered further in this chapter.
NRW (scoping response dated 3 July 2020)	Passerines - Passerines should not be scoped out as they may be affected during the construction phase.	Current NatureScot guidance does not recommend survey of moorland or farmland passerines, although incidental records of bird species of conservation concern (including passerines) were collected during breeding wader surveys. Whilst detailed surveys for passerines were scoped out it is recognised that there are potential legal implications relating to nesting birds during construction (from damage to or destruction of active nests) and impacts on nesting birds (including passerines) are therefore addressed within this chapter.

Consultee	Key issues raised	Actions in response to consultee comments
NRW (scoping response dated 3 July 2020)	Gulls - Gulls should be included as target species as these are likely to be present in larger numbers.	Gulls were recorded as secondary species during VP surveys with only infrequent records of relatively small numbers of birds (see Technical Appendices 8.1-8.4, Volume 4). Significant effects are therefore unlikely and further surveys in which gulls were included as primary target species were not considered necessary.
NRW (scoping response dated 3 July 2020)	Post-construction collision monitoring - A post construction collision monitoring plan will be required.	Current NatureScot guidance on monitoring states that not all wind farm planning consents will require post-construction monitoring, with monitoring most likely to be required where Schedule 1 or Annex 1 (of the EC Birds Directive) species may be affected, in relation to specific management issues or to resolve uncertainties. Post-construction monitoring for breeding waders is proposed (see Section 8.9). Based on the results of collision risk modelling (see Section 8.6 and Technical Appendix 8.5, Volume 4), post-construction collision monitoring is not considered necessary and is therefore not proposed.
Merthyr Tydfil County Borough Council (MTCBC) (scoping response dated 29 June 2020)	Additional surveys - MTCBC state that the following additional survey work is required: Surveys for nocturnal species, especially owls; surveys for wintering and migratory waterfowl, especially geese and swans; and surveys for all birds on passage from wintering to breeding and breeding to wintering areas. MTCBC also stated that a second year of non-breeding season flight surveys should be carried out.	See response to PINS comments in relation to nocturnal species. In relation to wintering and migratory waterfowl (and other species on passage), VP surveys were conducted monthly for a 24-month period. There is no evidence that the Site supports significant numbers of waterfowl or lies on an important migratory flight path for any species and therefore additional surveys were not considered necessary. A second year of non-breeding surveys was undertaken, commencing in September 2020 and continuing until March 2021 Further details of survey methods and results are provided in Sections 8.4 and 8.5 and Technical Appendices 8.1-8.4 (Volume 4) .

Consultee	Key issues raised	Actions in response to consultee comments
MTCBC (scoping response dated 29 June 2020)	Cumulative Impacts - The South Wales valleys act as funnels for migratory birds at certain times of the year. The cumulative impact assessment needs to take this into consideration.	The assessment of cumulative impacts is provided in Chapter 13: Cumulative Effects. As noted above, there is no evidence from the surveys undertaken that the Site lies on an important migratory flight path for any species.
Caerphilly County Borough Council (CCBC) (scoping response dated 6 July 2020)	Baseline Information - The Applicant should include the following information: • Ground Nesting Bird Survey • Breeding Bird Survey • Winter, Spring, Summer and Autumn Bird Flight Surveys and Winter Bird Walkover Survey.	In line with current NatureScot guidance, surveys for breeding waders and breeding raptors were undertaken in both 2019 and 2020. As noted in response to NRW comments incidental records of other bird species of conservation concern were also collected during breeding wader surveys. Baseline VP (flight activity) surveys were conducted monthly for a 24- month period and therefore cover all four seasons (see response to NRW and MTCBC comments). Winter bird walkover surveys are not required under current NatureScot guidance and were therefore not undertaken. Further details of survey methods and results are provided in Sections 8.4 and 8.5 and Technical Appendices 8.1-8.4 (Volume 4).
NRW (further consultation prior to submission of draft ES in November 2022)	Several attempts were made to consult further with NRW, under their 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.	n/a

Consultee	Key issues raised	Actions in response to consultee comments
MTCBC (Online meeting with Matthew Davies, 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 for further detail.
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 possible displacement of curlew, and additional biodiversity enhancement, 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 8.8 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 possible displacement of curlew, and additional biodiversity enhancement, 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 8.8 and Technical Appendix 7.6, Volume 4).

NRW (Statutory pre-application consultation letter dated 21/12/22) (Subsequent meeting regarding NRW statutory pre-application consultation letter 24/01/23)	NRW consider it is not clear in Chapter 8 of the Draft ES how their EIA Scoping advice has been fully taken into consideration. The list of target/receptor species does not reflect, for example, their advice in relation to the designated bird features of Special Protection Areas, Ramsar sites and Sites of Special Scientific Interest that should be scoped in. The list of target/receptor species needs to consider species listed under Section 7 of the Environment Act (Wales) 2016 as well as those listed on the Red List (BoCC Wales). NRW consider it is not clear why winter walk over surveys were not undertaken. They advise further information is provided in the planning application to adequately justify this. NRW note the 2020 survey data confirms four pairs of curlew have been identified within 800m of the turbines. NRW advise further information is provided in the planning application to address how curlew displacement will be avoided or mitigated for.	It was agreed at the meeting on 24/01/23 that the target species comment applies only to lesser black backed gull and NRW agreed at the meeting that significant effects on lesser black-backed gull were not likely in light of the justification provided. Within the current version of the ES, the reasoning for excluding lesser black-backed gull as a primary target species is provided previously within this table (see response to PINS Scoping Direction & NRW scoping response above) and refer also to paragraphs 8.4.14 and 8.4.58-8.4.61. The scope of ornithological survey work was agreed at the scoping stage and did not include winter walkover surveys. Justification for why walkover surveys were not undertaken has been added to the chapter, refer to paragraph 8.4.8. Figure 8.2 (Volume 3) has also been updated to show routes walked to and from VPs. Further validation in relation to golden plover is provided in paragraph 8.4.46 which concludes that the exclusion of winter walkover surveys does not affect the validity of the assessment. During the 24/01/23 meeting NRW agreed that offsite compensation is most appropriate in relation to curlew and accepted that obtaining agreement for management of the common was likely to be very difficult. NRW suggested that predator control should be the main focus of management and also stated that the approach should be site- specific and did not need to be too prescriptive at this stage, with further detail provided post consent. Proposed off-site habitat and predator management for breeding waders is detailed in the Outline Habitat Management Plan (OHMP) (Technical Appendix 7.6, Volume 4) and summarised in Section 8.8). In summary: The proposed off-site habitat restoration
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Consultee	Key issues raised	Actions in response to consultee comments
		and management will include the following habitat management practices to benefit curlew: management of grazing density and timing, management of tall vegetation and raising the water level to benefit curlew, via drain blocking. Lethal predator control, within the off-site area is also part of the habitat management plan. This would target control of foxes and corvids between February and July. In addition, the use of temporary electric fences to protect curlew nests from mammalian predators within the off-site management area (not possible on common land within Pen March) would be employed.

8.4 Approach to the assessment

- 8.4.1 The CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2022) (henceforth referred to as the CIEEM guidelines) form the basis of the impact assessment presented in this chapter. Reference has also been made to other relevant NatureScot (formerly Scottish Natural Heritage (SNH)) guidance as appropriate. Sources for other relevant guidance are listed in **Table 8.1** and are referenced in the chapter, as appropriate.

Study Area

- 8.4.2 The study area used for the ornithological impact assessment differs according to receptor as recommended by relevant good practice survey guidance, as defined by NatureScot guidelines (SNH, 2017).
- 8.4.3 Ornithology survey area boundaries are shown in **Technical Appendices 8.1 to 8.4, Volume 4**. These were based on the maximum developable area for turbines identified at the time, and buffers relevant to the species of concern. It is noted that the turbine layout now proposed covers a smaller area than the maximum developable area shown in **Technical Appendices 8.1 to 8.4, Volume 4**.
- 8.4.4 **Figure 8.1 (Volume 3)** shows the ornithology survey areas in relation to the Proposed Scheme layout and **Figure 8.2 (Volume 3)** shows the VP locations and viewsheds (the area visible from each VP) in relation to the Proposed Scheme layout.

Baseline Data Collection Methodologies

- 8.4.5 A desk study was undertaken to collate existing information on bird populations in and around the Site, and to identify target species for baseline surveys. This information, combined with baseline survey results, was utilised to put each target

bird species recorded within the study area into context in terms of its national, regional and local importance.

8.4.6 Primary sources of contextual data from the desk study were as follows:

- South-east Wales Biodiversity Records Centre (SEWBRc) provided data on protected, priority and other species of conservation concern occurring within a search distance of 2 km. Data were initially requested in June 2019 for a search area of 2 km as measured from the Site boundaries in place at that time (which covered a larger area than the current Site Boundary) with an update requested in September 2022 covering a search area of 2 km from a central point within the Site Boundary.
- Natural Resources Wales Website (information regarding designated sites)¹.
- Lle Geo-Portal for Wales (information regarding designated sites)².

Field Survey Methodology

8.4.7 Baseline ornithology surveys were conducted between April 2019 and March 2021 inclusive. Full details of survey methodologies are presented in **Technical Appendices 8.1 to 8.4 (Volume 4)** with a summary provided below.

8.4.8 No winter walkover transect surveys are required under current NatureScot guidance, unless waterbirds are a specific concern, based on habitat or nearby designations, which is not the case at Pen March. The coverage from the VPs was considered very good and therefore winter flocks, even on the ground were considered highly likely to be identified. In addition, accessing the various VP locations meant that much of the habitat within the Site was effectively covered whilst walking to and from VPs prior to and following VP surveys. This, along with the VP surveys themselves, would have identified any significant flocks or sightings of relevant species (e.g. golden plover *Pluvialis apricaria*) and these would be recorded as incidental observations by surveyors. A map of the routes taken to each VP is provided in **Figure 8.2, Volume 3**.

Flight Activity Surveys

8.4.9 VP surveys commenced in April 2019 and continued until March 2021. VP watches aimed to quantify the flight activity of primary and secondary target species within the study area. Two VPs were used, one located to the north of Turbine 4 and east of Turbine 2 and the other located to the south-west of the control building and electrical compound and energy storage location (**Figure 8.2, Volume 3**). These provided good coverage of the proposed turbine locations and a 500 m buffer. 36 hours of survey were completed from each VP per season, meaning that the total survey effort from each VP over the two-year survey period was 144 hours.

8.4.10 Target species for the surveys were defined by legal and/or conservation status and vulnerability to impacts caused by wind turbines, as defined in NatureScot (SNH, 2017) guidance. Primary target species included all Annex I and/or Schedule 1 raptor

¹ <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/>

² <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.

and owl species plus kestrel *Falco tinnunculus*³, all wildfowl species excluding feral geese and all wader species. Secondary target species included non-Annex I and/or Schedule 1 raptor species, gulls and raven *Corvus corax*.

- 8.4.11 The main purpose of VP watches is to collect data on primary target species that will enable estimates to be made of:
- The time spent flying over the Site.
 - The relative use by birds of different parts of the Site.
 - The proportion of flying time spent within the provisional upper and lower risk height limits as determined by the potential turbine rotor diameter and rotor hub height.
- 8.4.12 For each primary target species observation, the following details were recorded:
- Time of observation.
 - Duration of flying bout.
 - Species, age and sex (where determinable).
 - Time spent within each height band.
- 8.4.13 Taking into account the possible dimensions of the turbines likely to be used, based on information available at the time of survey, the height bands used were as follows:
- 1 = <15 m
 - 2 = 15-30 m
 - 3 = 30-150 m
 - 4 = 150-200 m
 - 5 = >200 m
- 8.4.14 In addition, a summary of observations of secondary target species was recorded at the end of each five-minute period during VP watches to provide an index of flight activity for secondary target species within the Site, in accordance with current NatureScot guidance.
- 8.4.15 Lesser black-backed gull *Larus fuscus* was excluded as a target species based on current NatureScot guidance. This species is a qualifying interest feature of the Severn Estuary Ramsar site, located approximately 34 km to the south of the Proposed Scheme but were recorded as a secondary species during the surveys because the gulls recorded at the site are not considered likely to form part of the Ramsar population (see **Table 8.2** and paragraphs 8.4.58-8.4.61 for further details).

Breeding wader surveys

- 8.4.16 Breeding wader surveys were undertaken in 2019 and 2020, between April and July, covering all suitable habitat within 500 m of the developable area under consideration at that time (which includes all of the proposed turbine locations) see **Figure 8.1 (Volume 3)**. These followed current NatureScot guidance which includes recommendations set out in (Calladine *et al.*, 2009), requiring an adapted Brown and Shepherd method (Brown & Shepherd, 1993) with four surveys, at least seven days

³ Not Annex I or Schedule 1 but classified as a primary target species as a result of behaviour which makes this species potentially vulnerable to impact from wind farms, for example collision mortality.

apart, between mid-April and early July. Surveys specifically focused on wader species, although other non-wader species of conservation concern were also recorded as seen/heard.

- 8.4.17 Territory locations were mapped, based on approximate territory centres from behavioural observations undertaken during the breeding wader surveys.

Breeding raptor surveys

- 8.4.18 Breeding raptor surveys were undertaken in 2019 and 2020 in line with Hardey *et al.*, 2013. Four survey visits targeting hen harrier *Circus cyaneus*, merlin *Falco columbarius*, peregrine *Falco peregrinus* and short-eared owl *Asio flammeus* were carried out over all accessible suitable habitat (moorland and crags) within 2 km of the developable area under consideration at that time (**Figure 8.1, Volume 3**), between April and July each year. Surveys involved using a combination of walkover surveys and shortened VP watches overlooking suitable habitat.

- 8.4.19 In addition, potentially suitable habitat (woodland and mature trees) within 2 km of the developable area, where accessible, was surveyed for breeding red kite *Milvus milvus* between April and August each year. Red kite surveys primarily utilised shortened VP watches overlooking suitable habitat.

Data collected during VP surveys and moorland breeding bird surveys were also used to define raptor territories within the relevant parts of the survey area.

Sensitivity of receptor

- 8.4.20 In accordance with the CIEEM guidelines, only ornithological receptors which are considered to be important (Valued Ornithological Receptors (VORs)) and likely to be affected by the Proposed Scheme should be subject to detailed assessment. It is not necessary to carry out detailed assessment of receptors that are sufficiently widespread, unthreatened and resilient to Proposed Scheme impacts and would remain viable and sustainable.
- 8.4.21 Ornithological receptors are considered within a defined geographical context. **Table 8.3** presents the geographic frame of reference used to inform this assessment.

Table 8.3: Geographical frame of reference used to value ornithological receptors

Geographic frame of reference	Example
International	European
National	Wales
Regional	South Wales Valleys National Land Character Area
County	Caerphilly County Borough and/or Methyr Tydfil County Borough
Local	The Pen March Wind Farm Site plus circa 5 km

- 8.4.22 For designated sites, importance should reflect the geographical context of the designation. For example, a Special Protection Area (SPA) would normally be

considered internationally important while a SSSI would normally be considered nationally important.

8.4.23 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 Birds Directive).
- Species included on the Section 7 list of species of principal importance in Wales (under the Environment (Wales) Act 2016).
- Species red-listed in the UK under the relevant lists of Birds of Conservation Concern (BoCC) (Stanbury *et al.*, 2021).
- Species on the red or amber list in Birds of Conservation Concern Wales 3 (BoCCW3) (Bladwell *et al.*, 2018).
- Welsh bird reports consolidate data from the previous year and provide a summary of individual species status in Wales, these are compiled by the Welsh Ornithological Society (WOS) (WOS, 2019).
- Where appropriate, the value of species populations has been determined using the standard '1% criterion' method, (Holt *et al.*, 2012). Using this, the presence of >1% of the international population of a species is considered internationally important; >1% of the national population is considered nationally important.

Assessing Impact and the Significance of an Effect

8.4.24 The general approach to impact assessment is described in detail in **Chapter 4: Environmental Impact Assessment Process**. The specific impact assessment methodology used in this chapter is outlined below.

8.4.25 Both direct and indirect impacts are considered. Direct impacts are changes that are directly attributable to a defined action, for example, the physical loss of habitat occupied by a bird species 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 important bird species.

8.4.26 Likely impacts are characterised by the following attributes:

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

8.4.27 Disturbance impacts have been assessed with reference to the relevant literature (for example Ruddock and Whitfield 2007, Goodship & Furness 2022, Drewitt and Langston, 2006; Hötter *et al.*, 2006; Pearce-Higgins *et al.*, 2009; Pearce-Higgins *et*

al., 2012). The relevant literature has also been used to recommend disturbance-free buffer zones considered likely to be required to help prevent nest failure due to disturbance during construction and operation.

- 8.4.28 The standard Band Collision Risk Model (CRM) (Band *et al.*, 2007) was used to estimate collision risk based on recorded target species activity levels and flight behaviour, proposed turbine numbers and specifications, and the relevant species biometrics and flight characteristics. Modelling collision risk under the Band CRM is a two-stage process. Stage 1 estimates the number of birds that fly through the rotor swept disc. Stage 2 predicts the proportion of these birds that have the potential to be hit by a rotor blade. Combining both stages produces an estimate of collision mortality in the absence of any avoidance action/behaviour by birds. Avoidance rates are then applied to generate predicted rates of collision mortality. Further details of the methods used in the CRM are provided in **Technical Appendix 8.5 (Volume 4)**.
- 8.4.29 For the purposes of this ornithology assessment, in accordance with CIEEM guidelines, a 'likely significant ecological effect' is an effect that either supports or undermines conservation objectives for VORs. Conservation objectives may be specific (for example, for a designated site) or broad (for example, national/local nature conservation policy). Effects can be considered significant at a wide range of scales from international to local, refer to **Table 8.3**. For example, a likely significant ecological effect on a regionally important population of a species is likely to be of regional significance.
- 8.4.30 Consideration of conservation status is important for evaluating the effects of impacts on bird species and assessing their significance. 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.

Avoidance, Mitigation, Compensation and Enhancement

- 8.4.31 A sequential process has been adopted to avoid, mitigate and compensate for ornithological impacts. This is referred to as the 'mitigation hierarchy'.
- 8.4.32 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

- 8.4.33 Cumulative effects result from effects arising from two or more developments. Effects may be:
- Additive (the sum of effects of different developments)
 - Antagonistic (the sum of effects are less than in a multiple independent additive model)
 - Synergistic (the cumulative effect is greater than the sum of the multiple individual effects)
- 8.4.34 NatureScot has produced guidance on assessing cumulative effects on birds due to onshore wind energy developments (SNH, 2018b). While antagonistic or synergistic models may occur in real-life settings, the approach adopted in the guidance is based on a simpler additive model.
- 8.4.35 Cumulative effects have been assessed for all species for which detailed assessment has been undertaken in this ES for which potentially significant cumulative negative effects are possible. The potential for cumulative effects with other wind farms due to disturbance and collision mortality has been assessed. Non-wind farm projects within the relevant areas are also considered where there is potential for cumulative disturbance effects. The cumulative assessment is based on consideration of residual effects, assuming that proposed mitigation and compensation measures for other projects are implemented.
- 8.4.36 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 PINS planning websites. This was reviewed and a short list of other developments to be included in the cumulative assessment was subsequently established.
- 8.4.37 With regard to the spatial extent of other developments to be included on the short list for inclusion in the cumulative assessment, current NatureScot guidance (2018) indicates that the default approach should be to assess cumulative effects at the Natural Heritage Zone (NHZ) scale, unless there is a reasonable alternative. NHZs in Scotland are an established biogeographical regional classification where bird population data are frequently available at this scale. As there are no NHZs in Wales, core foraging distances for the specific species have been used to define the spatial extent of the cumulative assessment, as proposed in the 2020 Scoping Report.
- 8.4.38 The significance of potential cumulative effects has been determined using the same method adopted in the assessment of effects for the Proposed Scheme considered in isolation. Cumulative effects are therefore considered likely to be significant if they undermine conservation objectives for important ornithological 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.
- 8.4.39 Information for the cumulative assessment was obtained from a variety of sources – see **Chapter 4: Environmental Impact Assessment Process** and **Chapter 13: Cumulative Effects** for further details.

Limitations of the assessment

- 8.4.40 The validity of ornithological survey data requires that they were obtained using accepted methodologies and that surveys were carried out in suitable conditions. The field survey methodologies outlined above and described in greater detail in **Technical Appendices 8.1 to 8.4 (Volume 4)** were all carried out using survey standards recommended by standard NatureScot guidance and were carried out during suitable times of the year. Any limitations in the survey data are described in **Technical Appendices 8.1 to 8.4 (Volume 4)** and summarised below.
- 8.4.41 Although a small number of VP surveys (three out of 96 survey sessions over two years) were completed in suboptimal weather conditions, in most cases all of the relevant 2 km viewing arc was visible and this is not considered to significantly affect the validity of the data collected. It is also noted that during such an extensive series of surveys it is inevitable that some surveys were completed in suboptimal conditions.
- 8.4.42 In the 2020 breeding season kestrel flights were only recorded as a secondary target species (using five-minute summaries instead of mapping individual flights) during the July and August vantage point surveys, which was an oversight (partly due to the relatively high number of red kite flights being recorded during these surveys). It is still possible to use these five-minute summaries to provide a measure of flight activity and contribute towards assessing collision risk, however.
- 8.4.43 With regard to viewshed coverage from VPs, using a viewing height of 1.8 m above ground and a surface offset of 30 m (equivalent to the lowest rotor swept height), the zone of theoretical visibility (ZTV) generated provides very good coverage of the Proposed Scheme Comparable Figures in **Technical Appendices 8.1 to 8.4 (Volume 4)** show a small gap in visibility, this is because the surface offset was done at a lower height of 15 m, before proposed turbine dimensions were known. It is considered that the vantage point data are representative of the Site as a whole and sufficient to inform a robust assessment of the Proposed Scheme.
- 8.4.44 VP surveys in March 2020 were not completed due to Covid-19 restrictions, but only one month of survey was missed and the affected surveys were completed at a later date so there was no reduction in survey effort. In the context of two years of VP survey this is not considered to affect the validity of the assessment.

- 8.4.45 Not all of the third-party land within the buffer zones for the breeding wader and breeding raptor surveys (refer to **Figure 8.1, Volume 3**) was accessible for walkover surveys. At the start of the survey period in 2019, access was limited to the area within the Site boundary plus the area of open moorland in the eastern part of the 2 km buffer. Access was subsequently granted to the area of open moorland to the north of the Site boundary and an area of fields to the south-east of the Site boundary in late June 2019. These areas were subsequently included within the July 2019 wader and raptor surveys and were included again during the surveys in 2020. Areas of land to which access was not possible were surveyed from public roads/footpaths and/or from vantage points located within the Site boundary. Coverage of potentially suitable habitat for waders and raptors within the inaccessible parts of the buffer zone from accessible vantage points was generally good and the lack of access is not considered to represent a significant limitation. It is however possible that a small number of wader and/or raptor territories may have been overlooked within inaccessible parts of the buffer zone.
- 8.4.46 The breeding raptor survey start dates of 16 April 2019 and 14 April 2020 (delayed in 2020 due to COVID-19 restrictions) were slightly later than the first visit recommended by Hardey *et al.* (2013) for red kite and peregrine (March to early April for both species). However, this is not considered significant in terms of identifying breeding territories of either species during the 2019 or 2020 season, as both species were active throughout the whole period and it is expected that any breeding activity within the survey area would have been recorded. Other surveys were all carried out within the parameters of relevant guidelines (both in terms of timings and weather conditions).
- 8.4.47 Over the Easter bank holiday weekend in 2020 (10-13 April 2020) there was a large fire across around 20% of the Site, extending further to the north-east (approximate area affected shown on **Figure 3 in Technical Appendix 8.3, Volume 4**). Although this did not directly affect any of the breeding bird surveys, the fire may have affected bird distribution and activity within the Site in 2020. The habitat within much of the impacted area was dominated by purple moor-grass *Molinia caerulea*, which had low breeding species diversity in 2019 (skylark *Alauda arvensis* and meadow pipit *Anthus pratensis* only). The fire may have temporarily increased food resource (prey availability for carrion feeders such as red kite) and in addition, provided increased nesting habitat for some ground-nesting species which prefer sparse vegetation cover (for example, some wader species).
- 8.4.48 Specifically in relation to the CRM, the height bands used to record flight activity do not correspond precisely to Potential Collision Height (PCH) for the Proposed Scheme (30-180 m). This is because the proposed turbine dimensions were not known at the time the surveys took place. Specifically, height band 4 (150-200 m) overlaps with the upper limit of the actual PCH (150-180 m). It was therefore necessary to make assumptions about the distribution of some of the flight heights recorded. Assuming an equal distribution of heights within height band 4, it is clear that a proportion of flights will be above risk height. Therefore, as theoretically only a proportion of flights from 150-200 m are at risk, the proportion of flights included within the CRM in height band 4 was assumed to be 30/50 (full details are provided in **Technical Appendix 8.5, Volume 4**). This is not considered to have significantly affected the CRM results.

- 8.4.49 On the basis of the above there are considered to be no significant limitations in the data on which the assessment is based.

Design basis and assumptions

- 8.4.50 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.
- 8.4.51 With respect to ornithology, the wind turbines were located away from curlew *Numenius arquata* territories identified during the 2019 and 2020 breeding season surveys as far as possible. Where possible, an 800 m turbine-free buffer was implemented around each territory centre (in accordance with Pearce-Higgins *et al.* (2009) disturbance/displacement of breeding curlew is unlikely beyond 800 m).
- 8.4.52 In practice, it was not possible to implement an 800 m buffer around all identified curlew territory centres and still retain an economically viable project. As many territories as possible were buffered however, and where an 800 m buffer was not possible, the maximum possible distance between proposed turbines and curlew territory centres was maintained.
- 8.4.53 Proposed micro-siting allowances are outlined in **Chapter 3: Proposed Scheme**. Wind turbines 4 and 6 will not be micro-sited closer to curlew territory locations to the south-east of the turbines. As such, it is not necessary to consider the potential effects of micro-siting in the assessment of effects on curlew. For other species, the proposed micro-siting allowance does not materially affect the assessment, for example the CRM is based on flights within 500 m of proposed turbine locations, and micro-siting is therefore not considered further.

Effects scoped out

- 8.4.54 In accordance with CIEEM guidelines, detailed assessment is only required for VORs. A list of VORs, based on survey work completed, is included in paragraph 8.5.8. These VORs ('target species', SNH 2017) are limited to those species which are afforded a higher level of legislative protection, or are species included as a result of their behaviour which makes them more likely to be subject to impact from wind farms. Potential effects on species of less than local importance are therefore scoped out of detailed assessment.
- 8.4.55 It is generally considered that passerine species (relating to the largest order (Passeriformes) of birds which includes over half of all living birds and consists chiefly of altricial songbirds of perching habits) are not significantly impacted by the operation of wind farms and they are therefore not included as VORs (SNH, 2017). The effects of construction and decommissioning in relation to nesting passerines is discussed in this chapter, in respect of the requirement to comply with the relevant provisions of the WCA 1981 (as amended) and consideration is also given to potential effects on nocturnally migrating passerines from proposed aviation lighting. However, other potential effects on passerine species are scoped out of further assessment.

- 8.4.56 As set out in the 2020 Scoping Report, effects on designated sites are scoped out due to distance between the Site and the nearest site(s) designated for their ornithological interest. This includes effects on Flat Holm and Steep Holm SSSI and the Severn Estuary Ramsar site (outside of the initial search area but raised during scoping consultation, notably in relation to possible effects on breeding lesser black-backed gull, refer to **Table 8.2**). Gulls were recorded as secondary species during breeding and non-breeding vantage point (VP) surveys. In accordance with current NatureScot guidance this means that a summary of observations was recorded at the end of each five-minute period during VP watches to provide an index of flight activity within the Site.
- 8.4.57 During breeding surveys in 2019 and 2020, lesser black-backed gull was recorded during only 5 % of five-minute recording periods in both years with a peak count of six and 45 birds respectively (see **Technical Appendices 8.1 and 8.3, Volume 4**).
- 8.4.58 Furthermore, lesser black-backed gulls were noted to be breeding on factory roofs to the south of the A465 and most of the activity that was recorded concerned gulls moving between the factories and the water bodies in the south of the Site Boundary, outside the developable area for turbines.
- 8.4.59 On the basis of the above, significant effects on the Flat Holm and Steep Holm SSSI and Severn Estuary Ramsar lesser black-backed gull populations are not likely and are not considered further in this chapter.
- 8.4.60 For the proposed battery storage facility, habitat loss and disturbance during construction and decommissioning are assessed as part of the overall assessment of construction effects of the Proposed Scheme. During operation, the only potential impact on birds resulting from the proposed battery storage facility is considered to be a small increase in noise. The noise associated with the operation of this infrastructure is likely to be minimal however, and therefore specific consideration of the battery storage facility is scoped out of the assessment.

8.5 Existing Environment

Desk study data

Designated Sites

- 8.5.1 A search was made for all sites with international, national or local authority designations for their ornithological interests. This included SPAs, Ramsar sites, and Sites of Special Scientific Interest (SSSIs) within a 10 km radius of the Site.
- 8.5.2 There are no statutory designated sites notified or classified for their ornithological interest within 10 km of the Site, refer to figures provided in **Technical Appendix 7.1, Volume 4**).
- 8.5.3 The nearest international designation is the Severn Estuary SPA (Wales) which is located more than 34 km to the south-east of the Site. Given the intervening distance it was therefore proposed in the 2020 Scoping Report that effects on statutory designated sites can be scoped out of the ornithological assessment.

- 8.5.4 Scoping consultation identified possible effects on lesser black-backed gulls breeding within the Flat Holm and Steep Holm SSSI and the Severn Estuary Ramsar site, which are outside of the initial search area. However, effects on these designated sites have also been scoped out of the assessment, refer to paragraphs 8.4.56-8.4.60 and **Table 8.2**.
- 8.5.5 There are a number of non-statutory designated sites within 2 km of the Site (see figures provided in **Technical Appendix 7.1, Volume 4**). The following MTCBC Sites of Importance for Nature Conservation (SINCs)/Wildlife Sites include birds within their site description:
- Blaenmorlais SINC- the site is likely to be important for a range of ground-nesting birds.
 - Cefn Gelligaer, West of Deri SINC - The northern area of this SINC supports breeding lapwing *Vanellus vanellus*.
- 8.5.6 Blaenmorlais SINC's designation does not specify which species of ground-nesting birds are referred to, although if the species were wading birds (for example, curlew or lapwing) it is assumed that this would have been explicit in the designation, due to their high conservation status. Therefore, the ground nesting birds are considered likely to be passerine species (e.g. meadow pipit and skylark), which not likely to be significantly affected by the operation of the Proposed Scheme. The site is sufficiently distant from areas of construction for effects on nesting passerines to be unlikely. Therefore, effects on the ornithological interest of Blaenmorlais SINC are scoped out of the assessment.
- 8.5.7 Cefn Gelligaer, West of Deri SINC is located to the south of the Site, south of the A465. Due to lapwing being listed on the designation, possible effects on the ornithological interest of this SINC are considered alongside lapwing within the assessment.

Field survey results

Flight activity (VP) survey results

- 8.5.8 The following primary target species were recorded during the VP surveys:
- Raptor and owl species, including:
 - hen harrier
 - marsh harrier *Circus aeruginosus*
 - red kite
 - merlin
 - peregrine
 - kestrel
 - short-eared owl
 - Wildfowl and wader species including:
 - curlew
 - snipe *Gallinago gallinago*
 - mallard *Anas platyrhynchos*
 - goosander *Mergus merganser*

- golden plover
- tufted duck *Aythya fuligula*
- lapwing

8.5.9 The following secondary target species were recorded:

- buzzard *Buteo buteo*
- sparrowhawk *Accipiter nisus*
- cormorant *Phalacrocorax carbo*
- herring gull *Larus argentatus*
- lesser black-backed gull
- black-headed gull *Chroicocephalus ridibundus*
- common gull *Larus canus*
- raven

8.5.10 Full details of the flight activity survey results (including figures showing flight lines for primary target species) are provided in **Technical Appendices 8.1 to 8.4 (Volume 4)**. A summary of primary target species flights recorded during the surveys, including the number of flights passing through the collision risk zone (CRZ), as defined by the outermost blades of the proposed turbines plus a 500 m buffer, is provided in **Table 8.4**.

Table 8.4: Number of primary target species flights and individuals observed passing through the Pen March CRZ during VP surveys (April 2019 to March 2021)

Species	Period of analysis	Total number of birds recorded in flight	Flights through CRZ		Flights through CRZ at PCH	
			Flights	Individuals	Flights	Individuals
Mallard	Breeding season 2019 (1 Apr-31 Aug)	3	0	0	0	0
	Non-breeding season 2019/20 (1 Sep-31 Mar)	10	1	4	0	0
	Breeding season 2020 (1 Apr-31 Aug)	8	2	2	0	0
Tufted duck	Non-breeding season 2019/20 (1 Sep-31 Mar)	3	0	0	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	16	0	0	0	0
Goosander	Non-breeding season 2019/20 (1 Sep-31 Mar)	19	0	0	0	0
	Breeding season 2020 (1 Apr-31 Aug)	18	0	0	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	7	0	0	0	0
Red kite	Breeding season 2019 (1 Apr-31 Aug)	60	42	47	23	27
	Non-breeding season 2019/20 (1 Sep-31 Mar)	19	17	17	0	0
	Breeding season 2020 (1 Apr-31 Aug)	81	53	68	20	30
	Non-breeding season 2020/21 (1 Sep-31 Mar)	44	33	34	8	9
Marsh harrier	Breeding season 2019 (1 Apr-31 Aug)	9	9	9	0	0
Hen Harrier	Breeding season 2019 (1 Apr-31 Aug)	2	2	2	0	0
	Non-breeding season 2019/20 (1 Sep-31 Mar)	2	2	2	0	0
	Breeding season 2020 (1 Apr-31 Aug)	9	8	9	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	8	6	6	0	0

Species	Period of analysis	Total number of birds recorded in flight	Flights through CRZ		Flights through CRZ at PCH	
			Flights	Individuals	Flights	Individuals
Kestrel <i>* incomplete data in July/ August 2020 when mistakenly recorded as secondary species only</i>	Breeding season 2019 (1 Apr-31 Aug)	3	3	3	2	2
	Non-breeding season 2019/20 (1 Sep-31 Mar)	2	1	1	0	0
	Breeding season 2020 (1 Apr-31 Aug)*	1	0	0	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	15	14	15	0	0
Merlin	Breeding season 2020 (1 Apr-31 Aug)	3	3	3	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	1	1	1	0	0
Peregrine	Breeding season 2019 (1 Apr-31 Aug)	4	2	2	2	2
	Non-breeding season 2019/20 (1 Sep-31 Mar)	3	2	2	2	2
	Breeding season 2020 (1 Apr-31 Aug)	2	2	2	2	2
	Non-breeding season 2020/21 (1 Sep-31 Mar)	1	1	1	0	0
Golden plover	Non-breeding season 2019/20 (1 Sep-31 Mar)	289	3	289	2	282
	Breeding season 2020 (1 Apr-31 Aug)	13.	3	13	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	13	3	13	2	5
Lapwing	Non-breeding season 2020/21 (1 Sep-31 Mar)	36	1	6	0	0
Snipe	Breeding season 2019 (1 Apr-31 Aug)	2	0	0	0	0
	Non-breeding season 2020/21 (1 Sep-31 Mar)	1	1	1	0	0
Curlew	Breeding season 2019 (1 Apr-31 Aug)	4	1	1	0	0
	Breeding season 2020 (1 Apr-31 Aug)	28	13	18	0	0
Short-eared owl	Non-breeding season 2020/21 (1 Sep-31 Mar)	2	2	2	0	0

Breeding wader surveys

- 8.5.11 Full details of breeding wader surveys are contained in **Technical Appendices 8.1 and 8.3 (Volume 4)**. Wader territories identified across 2019 and 2020 combined are shown in **Figure 8.3 (Volume 3)**.
- 8.5.12 In 2019, two potential curlew territories were identified within the area surveyed. One territory was confirmed to be located outside the Site Boundary to the east and one was unconfirmed within the Site Boundary to the south of proposed turbine locations. A single unconfirmed snipe territory was also identified outside the Site Boundary to the east.
- 8.5.13 In 2020, four confirmed curlew territories were identified, one within the Site Boundary to the south of Turbine 4, and the other three outside the Site Boundary to the east. At least two pairs hatched young, although fledging was not confirmed. Two confirmed snipe territories were identified, both within the Site Boundary. A single common sandpiper *Actitis hypoleucos* territory and a single unconfirmed lapwing territory were identified outside the Site Boundary but within the 500 m survey buffer. Little ringed plover *Charadrius dubius* was also recorded, in early May 2020, but there were no other records and the species was considered to be on passage rather than breeding.

Breeding raptor surveys

- 8.5.14 During the 2019 surveys, peregrine was identified as breeding in a disused quarry outside the 2 km survey buffer, and an adult male was recorded in suitable nesting habitat within the 2 km survey buffer, although at this location there was no evidence of breeding, refer to **Confidential Figure 5 in Technical Appendix 8.6 (Volume 4)**. The following species were also observed during the breeding season, but there was no evidence to support breeding nearby in 2019: red kite, kestrel, marsh harrier, hen harrier, short-eared owl and common buzzard.
- 8.5.15 In 2020, a red kite nest was identified within approximately 200 m of the Site Boundary and two buzzard nests were identified outside of the Site Boundary, but within 2 km, refer to **Technical Appendix 8.3 and Confidential Technical Appendix 8.6 (Volume 4)**.

Incidental observations of non-target species of conservation concern

- 8.5.16 During the 2019 breeding season, incidental records of the following species were recorded: goosander, herring gull, lesser black-backed gull, skylark, meadow pipit, wheatear *Oenanthe oenanthe*, stonechat *Saxicola torquata*, redstart *Phoenicurus phoenicurus*, linnet *Linaria cannabina*, swallow *Hirundo rustica* and house martin *Delichon urbica*.
- 8.5.17 During the 2020 breeding season, incidental records of the following species were recorded: goosander, mallard, herring gull, lesser black-backed gull, cuckoo *Cuculus canorus*, skylark, meadow pipit, grasshopper warbler *Locustella naevia*, wheatear, stonechat, grey wagtail *Motacilla cinerea*, redstart, linnet, swallow, house martin and reed bunting *Emberiza schoeniclus*.

Evaluation of ornithological receptors

- 8.5.18 Applying the criteria outlined in the 'Sensitivity of Receptor' section (paragraph 8.4.19), an evaluation of the importance of the study area for each primary target species recorded during the baseline surveys is provided in **Table 8.5**. The target species with a value of 'local' and above are subsequently taken forward as VORs for detailed assessment. The Welsh population has been sought to inform the assessment, however this was not always available, and in these circumstances the Great Britain (GB) population has been used.

Table 8.5: Evaluation of Primary Target Species Populations within the Study area (VORs taken forward for detailed assessment in bold)

Value	VORs	Species information, status and baseline	Justification
Less than local	Mallard	• UK BoCC and BoCCW3 amber list. • GB population 59,00-140,000 pairs (2016), wintering 665,000 individuals (2012/13-2016/17) (Woodward <i>et al.</i>, 2020). • Common and widespread breeding resident, abundant passage migrant and winter visitor to all counties in Wales (WOS, 2019). • Baseline survey data: eight flights during the breeding seasons, comprising a total of 11 individuals, and four flights during the non-breeding season, comprising a total of 10 individuals, overall peak count of four birds over two survey years.	With a considerable GB and Welsh population and only occasional records of birds in flight, mallard is considered to be of less than local value.
Less than local	Tufted duck	• UK BoCC green list. • BoCCW3 Amber list. • GB breeding population, 16,000-18,000 pairs (2016) and GB wintering population 130,000 pairs (Woodward <i>et al.</i>, 2020). • Resident breeding species in small numbers in several Welsh counties and a locally common winter visitor (WOS, 2019). • Baseline survey data: three flights during the non-breeding season, comprising a total of 16 individuals over two years.	With a considerable GB population and only occasional records in flight tufted duck were considered of less than local value.
Less than local	Goosander	• UK BoCC and BoCCW3 green list. • GB breeding population, 4,800 pairs (2016) and GB wintering population 14,500 (2012/13-2016/17 (Woodward <i>et al.</i>, 2020). • Breeding resident on most Welsh rivers, the population is believed to be slowly expanding but data are lacking. Most Goosanders wintering in Wales are thought to be British breeders (WOS, 2019). • Baseline survey data: three breeding season flights comprising a total of 18 individuals and four non-breeding season flights, comprising a total of 26 individuals over two years. A peak count of 12 individuals.	With a considerable GB population and only occasional records in flight goosander were considered to be of less than local importance.

Value	VORs	Species information, status and baseline	Justification
Regional	Lapwing	• UK BoCC and BoCCW3 red list. • Section 7 of the Environment Wales Act. • GB breeding population, 96,500 pairs (2016) (Woodward et al., 2020). • Specified within the Cefn Gelligaer, West of Deri SINC citation. The SINC is located outside the Site, but within 1 km, to the south. • Rapidly declining breeder in Wales – almost extinct in many counties. It is also a winter visitor, principally in coastal areas and especially when there is hard weather to the east (WOS, 2019). • Baseline survey data: two non-breeding season flights with a total of 36 individuals in two years. Lapwing was observed during breeding wader survey in 2020 and an unconfirmed territory was identified within the 500 m survey buffer.	One breeding territory of a red list declining wading species is considered to be of regional value.
Local	Golden plover	• Annex 1, UK BoCC green list, BoCCW3 red list. • Section 7 of the Environment Wales Act. • GB breeding population, 32,500-50,500 pairs (2016), winter population of 410,000 individuals (2006/7) (Woodward et al., 2020). • Scarce and declining breeding species in Wales, found chiefly on the upland plateaux of Denbigh, Radnor, Ceredigion and Brecon. Localised in winter, usually in large flocks (WOS, 2019). • Baseline survey data: three breeding season flights, comprising a total of 13 individuals and six non-breeding season flights comprising a total of 302 individuals over two years. Peak count of 220 observed in a single flight. No evidence of breeding golden plover within the developable area under consideration at the time of survey, with the breeding season records likely to relate to birds on passage.	With a considerable UK population, occasional records only and no evidence of breeding on site, golden plover were considered of no more than local importance.

Value	VORs	Species information, status and baseline	Justification
National	Curlew	• UK BoCC and BoCCW3 red list. • Section 7 of Environment Wales Act. • Welsh population, 1,100 pairs, from a 2006 all Wales survey (Johnstone et al., 2007) or between 400 (extrapolated from a small sample repeat survey) and 1,700 breeding pairs (extrapolated from Bird Atlas all-Wales re-survey) (Gylfinir Cymru/ Curlew Wales, 2021). • Widespread but declining breeding species in upland Wales and a few lowland sites. Abundant winter visitor mainly to coastal areas (WOS, 2019). • Subject to a Wales Action Plan for the Recovery of Curlew. The Proposed Scheme is just over 2 km from the Usk Catchment and Llangorse Lake Important Curlew Area (ICA) #12 (Gylfinir Cymru/ Curlew Wales, 2021). • VP survey data: 14 flights in the breeding season over two years, a total of 32 individuals observed during VP surveys, peak count of four individuals in one flight. • Breeding wader surveys identified two breeding territories, one confirmed and one unconfirmed in 2019. In 2020 four confirmed territories were identified within the area surveyed.	Four pairs (based on 2020 survey data) represents between 1 % and 0.23 % of the Welsh breeding curlew population (based on the smallest and largest figure quoted in the Wales Action Plan for Curlew). In the worst-case scenario with the smallest population of 400, the 1 % criteria for national importance is reached. Due to the decline in curlew within Wales of 6 % a year and curlew now considered to be the most pressing bird conservation priority in Wales (Gylfinir Cymru/ Curlew Wales, 2021), a precautionary approach has been taken and the curlew within the survey area is considered of national value.
County	Snipe	• UK BoCC and BoCCW3 amber list. • Welsh population estimate 1,100 pairs (Hughes et al., 2020). • Widespread breeding bird, nesting in all counties of Wales but in small and declining numbers. Substantial numbers in winter (WOS, 2019). • Baseline survey data: one snipe flight recorded in the non-breeding season and two flights in the breeding season over two years, all flights of individual birds. Breeding wader surveys identified one displaying snipe in 2019, outside the Site Boundary. In 2020 one territory and one probable nest near proposed Turbines 3 and 5 respectively were recorded.	A peak count of two breeding territories (0.18 % of the national population) is not nationally important and is also unlikely to represent >1 % of the regional population. One pair of snipe is considered likely to be of county value however.

Value	VORs	Species information, status and baseline	Justification
Local	Common sandpiper	• UK BoCC and BoCCW3 amber list. • GB breeding population 13,000 pairs (2016), (Woodward et al., 2020) • Summer visitor that breeds in all counties of Wales except Pembroke, albeit sporadically in Anglesey and Flintshire. Very small numbers over-winter (WOS, 2019). • Baseline survey data: A single breeding territory was identified to the east of the Site Boundary within the breeding wader survey area in 2020.	Only one observation over two years, considered to be of local value, as confirmed breeding territory identified.
Local	Marsh harrier	• Annex 1. • UK BoCC and BoCCW3 amber list. • GB breeding population, 590-695 pairs 2016 (Woodward et al., 2020). • Rare breeding bird in Wales. Rare Breeding Birds Panel (RBBP) estimate: four nests in two counties of Wales in 2017; occasionally overwinters (WOS, 2019). • Baseline survey: nine breeding season flights, all individuals recorded in 2019 with zero sightings in 2020, and zero non-breeding flights in two years. Marsh harrier were not recorded breeding within the 2 km survey area.	Usage of the Site by marsh harrier was irregular, all observations were made in 2019 and these occurred over two days in June. The individual observed was considered to be a juvenile. Due to the lack of regular use of the Site by this species, marsh harrier is considered to be of no more than local value.

Value	VORs	Species information, status and baseline	Justification
Local	Hen harrier	• Annex 1. • UK BoCC and BoCCW3 red list. • Schedule 1 WCA. • Section 7 of the Environment Wales Act. • Welsh population, 35 pairs (Wotton et al., 2018). • Small numbers breed in the uplands of north and mid-Wales. (RBBP) estimates: 29-51 pairs in 2017 in Wales. Otherwise, a winter visitor and passage migrant in small numbers (WOS, 2019). • Baseline VP surveys: ten breeding season flights of 11 individuals (two flights in June 2019, eight flights in April 2020) and ten non-breeding season flights (two flights in 2019/20, in September. Eight flights in 2020/21, recorded in all months apart from November and December) in two years. • Hen harrier were not recorded breeding within the 2 km survey area.	Hen harrier was only recorded irregularly during the surveys. With flights specifically around times of passage or dispersal from breeding areas; June in 2019, April in 2020, September in 2019/20 and the winter months (November and December) of 2020/21. The usage of the Site by hen harrier is considered to be sporadic and more associated with passage. Therefore, the value of the survey area for the species is considered to be no more than local.
County	Red kite	• Annex 1. • UK BoCC green list. • BoCCW3 amber list. • Welsh population, 2,500 pairs (Welsh Kite Trust, 2019). • Formerly widespread, but almost eradicated between the late 18th and early 20th centuries. Now an increasing resident breeder in Wales (WOS, 2019). • Baseline survey: 108 flights, involving 128 individuals recorded during the breeding season and 62 flights, involving 63 individuals recorded during the non-breeding season over two years. • Breeding was considered likely to have occurred in 2020 only, in a private area of woodland approximately 200m from the Site Boundary.	Red kite was considered to breed within 2 km in 2020 only, one pair is 0.04% of the current Welsh population of red kite, considerably below the threshold for national importance and unlikely to represent >1% of the regional population. One pair of kites is considered likely to be of county value however, particularly given the relatively large number of flights recorded during the VP surveys.

Value	VORs	Species information, status and baseline	Justification
Less than Local	Short-eared owl	• Annex 1. • UK BoCC amber list. • BoCCW3 red list. • GB breeding population 610-2,150 pairs (2016) (Woodward et al., 2020). • Scarce breeding resident in Wales. RBBP: 12-21 pairs in Wales in 2017. Winter visitor and passage migrant in small numbers to all Welsh counties. • Baseline survey data: Two flights of individuals birds recorded during the non-breeding season, none in the breeding season over two years. Short-eared owl were observed incidentally during the 2019 breeding raptor survey but were classified as not breeding within the 2 km survey area.	Two flights recorded in two years, suggesting the habitat within the Site is rarely used by this species. A less than local value was assigned due to the low number of sightings.
Local	Kestrel	• UK BoCC amber list. • BoCCW3 red list. • Section 7 of the Environment Wales Act. • Welsh population estimate 1,750 pairs (Hughes et al., 2020). • Rather scarce breeding resident throughout Wales. Partial and passage migrant to some counties in small numbers (WOS, 2019). • Baseline survey: individuals were observed in the breeding and winter seasons, with a total of 21 birds recorded in flight during the VP surveys. Breeding raptor surveys identified kestrel, but the conclusion in 2019 and 2020 was that this species was not breeding within the 2 km survey area.	This species is relatively widespread throughout Wales and as this species was not considered to be breeding on Site, kestrel is considered to be of no more than local importance.

Value	VORs	Species information, status and baseline	Justification
Local	Merlin	• Annex 1. • UK BoCC and BoCCW3 red list. • Schedule 1 WCA. • Welsh population, 94 pairs (Ewing et al., 2011). • Scarce breeding resident in Wales. RBBP estimates: 14-28 pairs in Wales in 2017. Also, a passage migrant and winter visitor (WOS, 2019). • Baseline survey; individual birds only observed, three breeding season flights and one non-breeding season flight in two years. • Was not considered to be breeding within the 2 km survey area in either breeding season.	Merlin was not considered to be breeding within the survey area in either year and usage of the Site was low, therefore the value was considered to be no more than local.
Regional	Peregrine	• Annex 1. • Schedule 1 WCA. • UK BoCC and BoCCW3 green list. • GB breeding population 1,650 pairs (2014) (Woodward et al., 2020). • Resident breeding species in all counties of Wales, but breeding population declined 12% between 2002 and 2014 to 249 pairs following a period of recovery since the 1960s. RBBP estimates: 104-157 pairs in Wales in 2017 (WOS, 2019). • Baseline survey: six breeding season flights and four non-breeding season flights in two years, all individual flights. Breeding occurred outside the 2 km survey area, in a disused quarry to the north, in 2019 but not in 2020.	One pair of breeding peregrine recorded in 2019 represents less than 1% of the national population, below the threshold for national importance. However, one pair of peregrine, albeit nesting outside the 2 km survey area, is considered to be of regional value.

Future baseline

- 8.5.19 In the absence of the Proposed Scheme, and assuming the continuation of the current land use in the area, the bird populations are largely likely to continue to be present in similar abundances and distributions. However, the UK has experienced a decline in species abundance of 13 % on average, 15 % of species within the UK are threatened with extinction, and since 1970 the abundance of UK priority species has declined by 60 % (Hayhow *et al.*, 2019). Bird species in the UK have declined by 11 % between 1970-2018 (DEFRA, 2021) and in Wales, long-term monitoring shows numbers and distribution of approximately a third of Welsh birds are declining significantly (Bladwell *et al.*, 2018). For curlew in particular, Wales, and the rest of the UK has experienced a significant decline, 50 % in the last 20 years (Gylfinir Cymru/ Curlew Wales, 2021) and this is likely to continue in the immediate to short-term at least, as actions to halt the decline take time to implement.
- 8.5.20 The 2021/22 outbreak of Highly Pathogenic Avian Influenza (HPAI) A (H5N1) has affected considerable numbers of wild birds within the UK. Waterbirds have been most impacted, but non-waterbird species, have been reported as well (Gov.UK, 2022). This could impact populations of affected species by increasing mortality and depending on the nature of the outbreak, could go on for a number of years.
- 8.5.21 Based on the above, it seems likely that a number of bird species populations in the area within and surrounding the Site will decline over the coming years, although the extent of any such declines cannot be accurately predicted at this time. A precautionary approach has therefore been adopted for the purposes of the assessment, whereby it is assumed that in the absence of the Proposed Scheme, current population levels will persist for the lifetime of the Proposed Scheme.

8.6 Assessment of effects

- 8.6.1 This assessment concentrates on the effects of construction, operation and decommissioning of the Proposed Scheme upon VORs. The following potential effects have been assessed:
- Habitat loss or damage (permanent and temporary) due to the construction of the Proposed Scheme.
 - Inadvertent damage to nests during construction and decommissioning of the Proposed Scheme.
 - Disturbance to birds during construction and decommissioning of the Proposed Scheme due to vehicular traffic, operating plant and the presence of construction workers.
 - Disturbance to birds due to the operation of the Proposed Scheme, in particular, vehicular traffic and the presence of people.
 - Barrier effects due to the operation of wind turbines.
 - Mortality of birds caused by collisions with wind turbine blades and other infrastructure, including collisions resulting from the use of aviation lighting.

8.6.2 Effects have been assessed in detail for the following VORs, in order of importance (refer to **Table 8.5** for justification):

- curlew
- snipe
- lapwing (including birds potentially associated with Cefn Gelligaer, West of Deri SINC)
- peregrine
- red kite
- kestrel
- golden plover
- common sandpiper
- hen harrier
- marsh harrier
- merlin
- Nesting birds (all species, in respect of inadvertent damage to nests during construction and decommissioning only)

Construction Phase Effects

Primary and Additional Mitigation and Good Practice Management

8.6.3 Full details of construction mitigation measures would be provided in a Construction Environmental Management Plan (CEMP). A draft CEMP is included as **Technical Appendix 3.1 (Volume4)**.

8.6.4 Good practice measures, as outlined below, would be employed where required, to reduce the possibility of damage and destruction (and disturbance in the case of sensitive species such as breeding raptors and waders), to occupied bird nests during the construction phase.

Timing of Works, Pre-Commencement Surveys and Implementation of Disturbance-Free Buffer Zones

8.6.5 Under the WCA 1981 (as amended), it is an offence, with only limited exceptions, to:

- intentionally take, damage or destroy the nest of any wild bird whilst it is in use or being built (applies year-round for nests of birds included in Schedule ZA1)
- intentionally take, or destroy the egg of any wild bird
- intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at (or near) a nest containing eggs or young, or disturb the dependent young of such a bird

8.6.6 Avoidance of damage to, or destruction of nests, or disturbance to sensitive species whilst nesting can be achieved through careful timing of construction activities. For example, restricting activities in sensitive areas as far as practicable in the early part of the breeding season (specifically for curlew, avoiding construction activity in previous nesting areas from mid- March through to mid- April) until the location and breeding status of nesting birds has been established.

- 8.6.7 If Site clearance and construction activities are required to take place during the main breeding bird season, from March-August inclusive, pre-commencement survey work would be undertaken to ensure that nest destruction (any bird species, including passerines) and disturbance to sensitive species (breeding raptors and waders) are avoided. Where applicable, construction would not take place within specified disturbance-free buffer zones for certain sensitive species during the breeding season.
- 8.6.8 Where required, disturbance-free buffer zones around nest sites of sensitive species would be applied and would be monitored closely. For breeding waders, disturbance-free buffer zones are only required until chicks have hatched and are capable of walking away from any sources of disturbance. For raptors, disturbance-free buffer zones would be required until chicks have fledged, or the relevant nest is confirmed to have failed.
- 8.6.9 During construction, the use of screens, or a screened rolling corridor of construction work is a potential method to limit the extent of construction disturbance, specifically during the breeding season. The use of screens is recommended in the literature (Pearce-Higgins *et al.*, 2012) and could be implemented during the construction of the Proposed Scheme, if required. If used, screens would not restrict access to land but would aim to provide a visual barrier between construction work and sensitive breeding bird species.
- 8.6.10 Based on survey data and the relevant literature (Ruddock and Whitfield 2007), (Hötter, 2006), (Goodship and Furness 2022), the following disturbance-free buffer zones are considered likely to be required to help prevent nest failure due to disturbance during construction, if construction is undertaken during the breeding season and if the relevant species are present. It should be noted that these distances represent a guide only and these may vary according to topography and other factors at each nest site.
- curlew 200-300 m
 - red kite 150-300 m
 - snipe 300 m
 - peregrine 500-750 m

Environmental Clerk of Works

- 8.6.11 A suitably qualified Environmental Clerk of Works (ECoW) would be employed for the duration of the construction period, although this may not necessarily be a full-time role throughout. The role of the ECoW would include the tasks outlined in **Chapter 6: Hydrology, Hydrogeology, Geology and Peat** and **Chapter 7: Ecology** alongside specific roles with regard to the ornithology interest of the Site:
- Prior to the start of construction and/or the breeding bird season, the ECoW would make contractors aware of the ornithological sensitivities within the Site (particularly with regard to the potential presence of sensitive breeding species such as breeding waders).
 - The ECoW would undertake surveys for nesting birds throughout the construction period that falls within the nesting season and set up and monitor appropriate exclusion areas whilst nests are in use. This would include nesting passerines, where nests could be damaged by construction activities.

Construction Effects

- 8.6.12 Potential effects, assuming that the good practice mitigation measures outlined above are implemented as required, are addressed for each important receptor in turn.

Nest Damage or Destruction

- 8.6.13 Damage or destruction to active nests could contravene the WCA 1981 (as amended). However, the good practice measures outlined above would avoid the likelihood of damage, destruction or disturbance to occupied bird nests during the construction phase. As such, **no significant effects, and no contravention of the relevant legislation, are likely** for any species due to nest damage or destruction.

Habitat loss

- 8.6.14 Construction of the Proposed Scheme would lead to habitat loss (refer to **Chapter 7: Ecology**). The permanent loss of habitats with potential value to support VORs amounts to approximately 9.57 ha and the temporary loss of habitats amounts to approximately 16.38 ha. Most habitat loss comprises a mosaic of marshy grassland, wet heath, acid flush, wet modified bog and semi-improved acid grassland. 21.5 ha of the habitat that will be permanently or temporarily lost lies within the Pen March / Traed y Milwyr Llechrhyd SINC and 4.45 ha lies within the Merthyr Common North SINC. All of the habitats affected have been heavily modified by livestock grazing and / or fire which has reduced the species and sward diversity and are generally not considered good examples of their habitat type. However, there is potential that this habitat loss could impact breeding species, such as curlew and snipe, that potentially use the habitat for nesting and foraging.
- 8.6.15 Species such as hen harrier, marsh harrier, merlin, red kite, peregrine, kestrel and golden plover may suffer some loss of available habitat for foraging. However, effects are not likely to be significant given the large size of their foraging ranges, their occasional use of the Site, and the wide availability of alternative breeding and foraging habitat. Therefore, hen harrier, marsh harrier, merlin, red kite, peregrine, kestrel and golden plover are not considered further in respect of habitat loss. In addition, breeding lapwing and common sandpiper were only recorded outside of the area affected by the Proposed Scheme and sufficiently far from any proposed construction activity (refer to **Figure 8.3, Volume 3**) that effects are not likely to be significant. These species are therefore also not considered further in respect of habitat loss.

Curlew

- 8.6.16 The effect of direct habitat loss on curlew due to wind farms is generally considered not to be significant compared to the species' overall territory size (core foraging range from nest site during breeding season of 1 km, maximum 2 km (NatureScot, 2016a)). Only one confirmed curlew territory (2020) and one unconfirmed curlew territory (2019) was located within the Site Boundary. The other four confirmed territories (one in 2019, three in 2020) were outside the Site Boundary (refer to **Figure 8.3, Volume 3**) although it is possible that parts of some of these birds' territories lie within the Site Boundary, and therefore could be subject to some habitat loss within the territory. The proportion of habitat loss within 1-2 km of the identified curlew territories would be a very small proportion of the overall territory area, due to the small footprint of the Proposed Scheme. With abundant alternative habitat available for nesting and foraging **no significant effect is likely** on the conservation status of curlew in terms of habitat loss caused by the Proposed Scheme.

Snipe

- 8.6.17 A snipe territory and a probable nest were identified within the Site Boundary in 2020 only (refer to **Technical Appendix 8.3, Volume 4** and **Figure 8.3, Volume 3**). Habitat suitable for nesting and foraging snipe (damp marshy grassland) is abundant throughout the Site, therefore given the small extent of habitat that would be lost, **no significant effect** is likely on the conservation status of snipe in terms of habitat loss.

Disturbance/Displacement

- 8.6.18 During the construction phase of the Proposed Scheme, the potential effects of associated noise and visual disturbance could lead to the temporary displacement or disruption of breeding and foraging birds. The level of impact would depend on the timing of potentially disturbing activities, the extent of displacement (both spatially and temporally) and the availability of suitable habitats in the surrounding area for displaced birds to occupy.
- 8.6.19 Potential effects are likely to be greatest for VORs under consideration during the breeding season (predominantly between March and August, depending on the species under consideration) and behavioural sensitivity to the effects would vary between species. The use of the Site outside of the breeding season by the VORs in question is likely to be limited in extent therefore is not likely to be significant.
- 8.6.20 Disturbance of birds due to construction activities of this type has not been sufficiently quantified in the literature and the available information is often contradictory. However, it is likely that construction impacts would be greater on species that are intolerant of noise and other sources of disturbance. Larger bird species, those higher up the food chain or those that feed in flocks in the open tend to be more vulnerable to disturbance than small birds living in structurally complex or closed habitats such as woodland (Hill *et al.*, 1997).

- 8.6.21 The potential effects associated with construction activities are only likely to occur for as long as the construction phase continues and are thus generally short-term in nature. The exception to this would be if a negative effect on the breeding success of a species were such that the local population becomes extinct and replacement through recruitment or re-colonisation does not occur. For example, a study by (Pearce-Higgins *et al.*, 2012) found that snipe and curlew densities declined significantly on wind farms during construction and had not recovered by the first year post-construction.
- 8.6.22 Disturbance/displacement effects during construction are only likely to significantly affect species breeding within the relevant parts of the study area (curlew and snipe) or species breeding in close proximity to the Site Boundary (red kite and common sandpiper).
- 8.6.23 The following species have not been assessed, as although observed during the breeding season, they were not identified as breeding within or in close proximity to the Site and are therefore unlikely to be significantly affected: hen harrier, marsh harrier, merlin, kestrel, golden plover (all non-breeding) and lapwing (an unconfirmed territory outside the Site Boundary, approximately 750 m from the closest infrastructure). Peregrine was also excluded, as although a nest was identified in 2019 (refer to **Technical Appendix 8.6 Confidential Figure 5, Volume 4**) this was approximately 4 km from any proposed infrastructure. A core foraging range of 2 km is specified for peregrine (SNH, 2016a), therefore the core foraging range for the identified nest would not overlap the construction area.
- 8.6.24 Construction disturbance can be readily mitigated by avoiding sensitive areas through the implementation of appropriately defined buffer zones and by timing construction activities to avoid periods where sensitive species are present (if and where possible), such as the breeding season. A range of good practice measures have therefore been proposed to mitigate for potential construction disturbance effects (refer to paragraphs 8.6.4 - 8.6.11) and the assessments below assume that these measures will be implemented.

Curlew

- 8.6.25 In 2019, two confirmed or potential breeding curlew territories were identified, one was within the Site Boundary and one was just beyond the Site Boundary to the east (refer to **Figure 8.4.1, Volume 3**). In 2020, a total of four breeding curlew territories were identified, one within the Site Boundary, east of proposed turbine 6 and south of proposed turbine 4. The other three territories were outside the Site Boundary, to the east (refer to **Figure 8.4.2, Volume 3**). This species is considered likely to hold breeding territories within the area earmarked for construction.
- 8.6.26 With the primary and additional mitigation measures forming part of the Proposed Scheme (see paragraphs 8.6.4 to 8.6.11), disturbance from construction on Site will be considerably reduced. As a result, short-term displacement of breeding curlew during the construction of the Proposed Scheme is considered unlikely and the effect of displacement during construction is **not likely to be significant**.

Snipe

- 8.6.27 The distance at which construction activity would affect snipe is likely to be relatively low, based on the species' propensity to remain still until flushed at close proximity. Their predominantly crepuscular activity also means that most construction work on Site is unlikely to take place at the same time as peaks in snipe courtship or feeding activities. A confirmed snipe breeding territory and a probable nest were identified within the Site in 2020 and an unconfirmed snipe territory was identified within the Site in 2019 (refer to **Figure 8.3, Volume 3**). All locations are within a few metres, if not within, likely construction areas.
- 8.6.28 With the primary and additional mitigation measures forming part of the Proposed Scheme in place (see paragraphs 8.6.4 to 8.6.11), it is considered that displacement of snipe during construction of the Proposed Scheme is unlikely, and the effect of displacement is **not likely to be significant**.

Red kite

- 8.6.29 Red kite is classified as likely to have bred within 2 km of the Site Boundary in 2020 and is the most frequently recorded VOR species, therefore it is likely that the Site is used by foraging red kites during the breeding season. Breeding was located outside of the Site Boundary, approximately 1 km from any proposed infrastructure. If this nesting location was used again, the potential for direct disturbance of nesting red kite during construction is very low, as the nest was located well beyond the larger 300 m buffer for disturbance identified (Ruddock and Whitfield, 2007; Goodship and Furness, 2022). Surveys and checks for nesting red kite will be undertaken in line with the primary and additional mitigation strategy detailed in paragraphs 8.6.4 to 8.6.11. Displacement of breeding red kite during the construction of Pen March is therefore unlikely and **no significant effect is likely**.

Common Sandpiper

- 8.6.30 Disturbance distances for common sandpiper are difficult to find although 75 m is quoted for commencement of alarm calling in regard to anglers (Yalden, 1992). Construction traffic would be considerably larger and bigger, therefore a similar distance to snipe is considered a suitable proxy (300 m in the breeding season) as a precaution. A single confirmed breeding territory for common sandpiper was identified during the surveys in 2020. This was located outside the Site Boundary, approximately 1 km from any proposed infrastructure (**Figure 8.3, Volume 3**). The Site itself does not contain any suitable breeding habitat for this species. On this basis, displacement of common sandpiper during construction is highly unlikely and **no significant effect is likely**.

Residual Construction Effects

- 8.6.31 Following the implementation of the primary and additional mitigation, as required, **no significant residual effects are likely** for any VORs during construction.

Operational Phase Effects

Disturbance/displacement and barrier effects

- 8.6.32 The operation of wind turbines and associated human activities for maintenance purposes have the potential to cause disturbance and displace birds from the Site. Disturbance effects during the operational phase is likely to be less than during the construction phase, as species may become habituated to the Proposed Scheme and disturbance due to human activities would be considerably reduced during operation, compared to construction.
- 8.6.33 Studies have shown that, in general, species are not disturbed beyond 500 m to 800 m from wind turbines (for example, Drewitt *et al.*, 2006) and references therein: Hötter *et al.*, 2006; Pearce-Higgins *et al.*, 2009) and, in some cases, birds do not appear to have been disturbed at all (for example, Devereux *et al.*, 2008; Whitfield *et al.*, 2010; Douglas *et al.*, 2011; Fielding and Haworth, 2013).
- 8.6.34 There is less consensus of opinion about disturbance effects closer to wind farm infrastructure. Pearce-Higgins *et al.*, (2009) found evidence of lower frequencies of occurrence of some species within the vicinity of wind turbines during the breeding season, with a significant reduction in frequency of occurrence, compared to control sites, in seven of the 12 species studied. Other studies of curlew (Whitfield *et al.*, 2010), involving long-term monitoring found no evidence of displacement due to wind farm infrastructure.
- 8.6.35 Individual turbines, or the Proposed Scheme as a whole, may also present a barrier to the movement of birds, restricting or displacing birds from much larger areas. The effect this would have on a population is subtle, and difficult to predict with any certainty. If birds regularly have to fly over or around obstacles or are forced into suboptimal habitats, this may result in greater energy expenditure. By implication, this will reduce the efficiency with which they accumulate reserves, potentially affecting their survival or breeding success. Barrier effects might lead indirectly to population level impacts, blocking regularly used flight lines between nesting and foraging or several wind farms interacting cumulatively to create an extensive barrier leading to long diversions (Drewitt and Langston, 2006). VORs which do not regularly fly directly through the wind farm envelope are not likely to be affected by barrier effects. All the VORs identified during the surveys were not considered to regularly commute through the wind farm area. Therefore, significant barrier effects are considered unlikely in this situation and are not discussed further.
- 8.6.36 Disturbance/displacement effects during operation are considered for species in the breeding season, that have been identified close to the proposed wind turbines. Birds during the breeding season are restricted to a single location due to the presence of a nest and requirement to feed young. The use of the study area outside of the breeding season by the VORs in question is likely to be limited in extent, as birds are more free to forage over larger areas, therefore is not likely to be significant. Other species are therefore not considered here.
- 8.6.37 VORs that are potentially vulnerable to disturbance/displacement based on current survey data are: curlew, lapwing, red kite, peregrine and snipe, as these species were identified as breeding within or close to the Proposed Scheme.

- 8.6.38 Whilst peregrine may suffer some disturbance from wind turbines whilst foraging, the breeding location was approximately 4 km outside of the Site. Effects are therefore not likely to be significant given the intervening distance, the large size of their foraging range and the wide availability of alternative foraging habitat. Similarly, the only possible lapwing territory recorded during the 2019 and 2020 surveys was at least 750 m from the closest turbine and is therefore not likely to be significantly affected by disturbance (this also applies to any lapwing breeding with the Cefn Gelligaer, West of Deri SIN).
- 8.6.39 Therefore, curlew, red kite (due to the relatively close proximity of the nesting location), and snipe are the only VORs subject to more detailed assessment.

Curlew

- 8.6.40 Results from the study by Pearce-Higgins *et al.*, (2009) suggest that curlew populations may show significant displacement effects up to 800 m from wind turbines and may decline by about 42.4 % within a 500 m circular buffer around the turbines. However, other studies (such as Whitfield *et al.*, 2010) involving long-term monitoring found no evidence of displacement due to wind farm infrastructure.
- 8.6.41 Whilst there is some uncertainty over the extent of potential disturbance impacts on curlew during wind farm operation (refer to paragraph 8.6.34) a precautionary approach has been adopted in this assessment, based on the findings of Pearce-Higgins *et al.* (2009). **Figures 8.4.1 and 8.4.2 (Volume 3)** show the locations of curlew territories identified in 2019 and 2020, with buffers included around each territory at 300 m, 500 m and 800 m. Using the disturbance buffer of 800 m suggested by (Pearce-Higgins *et al.*, 2009) and based on survey data for 2019 and 2020, up to a maximum of two curlew territories per year, one in 2019 and two in 2020, has the potential to be impacted by the operation of the Proposed Scheme. A *circa* 40 % decline would mean the loss of 0.8 breeding curlew territories in each year, in reality this is likely to be one pair permanently displaced by the Proposed Scheme. This equates to a 50% loss of breeding curlew territories, based on 2019 data (two territories recorded), or a 25% loss of breeding curlew territories based on 2020 survey data (four territories recorded). This is comparable to a maximum loss of 0.25 % of the Welsh breeding curlew population, based on the smallest population estimate of 400 pairs as a precaution.
- 8.6.42 A 0.25 % loss of the Welsh population of breeding curlew from the Proposed Scheme is a worst-case scenario, based on the largest disturbance buffer suggested (Pearce Higgins *et al.* 2009) and the smallest national population estimate. This is less than 1 % for a national impact and therefore is not considered a nationally significant effect on curlew. However, given the conservation status of this species and its decline, a loss of one pair is considered to represent a **significant negative effect** on breeding curlew **at a regional level**.

Snipe

- 8.6.43 There is some evidence of reduced habitat usage by snipe within operational wind farms. A 47.5 % decline in the abundance of snipe within 500 m of wind turbines has been reported (Pearce-Higgins *et al.*, 2009) and as for curlew, a precautionary approach has been adopted in this assessment on that basis.

- 8.6.44 On the basis of two snipe territories within 400 m of proposed turbine locations, based on survey data for 2019 and 2020 (**Technical Appendices 8.1 & 8.3, Volume 4, Figure 8.3, Volume 3**), a *circa* 50 % decline would mean that one pair of snipe would be permanently displaced by the Proposed Scheme. This would result in the possible loss of 0.09 % of the Welsh population and is therefore not significant at a national level or likely to be significant at a regional level. However, given the declining status of this species, a loss of one pair is considered to represent a **significant negative effect** on breeding snipe **at a county level**.

Red kite

- 8.6.45 Red kite was likely to have bred within 2 km of the Site Boundary in 2020, with a nest identified approximately 250 m from the Site Boundary (but approximately 1 km from the turbine area). Red kite was the most frequently recorded VOR species and the Site is regularly used by foraging red kites during the breeding season - 14% of the core foraging area of the 2020 nest overlapped with the Site. Direct disturbance of the nest during operation of the Proposed Scheme is considered to be unlikely, as there will be significantly less human activity once operational, compared to during construction and any human disturbance would be over 300 m from the identified nest location. Data from previous studies does not indicate displacement of red kite by wind farms, with red kite frequently visiting wind farms during the breeding season (Hötter *et al.*, 2006).
- 8.6.46 It is therefore considered, based on the literature and the proximity of the 2020 nest site, that breeding red kite are unlikely to be displaced by the operation of the Proposed Scheme and any effect is **not likely to be significant**.

Collision with wind turbines

- 8.6.47 Collision of a bird with turbine rotors is almost certain to result in the death of the bird. In low density populations, for example, raptors, this would have a greater negative effect on the local population than in higher density populations, for example, passerines, because a higher proportion of the local population would be affected. Larger birds such as raptors also live longer and have much slower reproductive rates than passerines, which can also increase the significance of the impact of collisions on the relevant population. The frequency and likelihood of a collision occurring depends on a number of factors which include aspects of the size and behaviour of the bird (including their use of a site), the nature of the surrounding environment, and the structure and layout of the wind turbines.

- 8.6.48 Collision risk is perceived to be higher for birds that spend much of the time in the air, such as foraging raptors and those that have regular flight paths between feeding and breeding/roosting grounds, for example geese. The risk of bird collisions at wind farms is greatest in areas where large concentrations of birds are present (such as on major migration routes), and in poor flying conditions, such as rain, fog, strong winds that affect birds' ability to control flight manoeuvres, or on dark nights when visibility is reduced (Langston and Pullan, 2003; Drewitt and Langston, 2006 and references therein). Birds may also be more susceptible if the wind farm is located in an area of high prey density. For diurnal foraging raptors, the proximity of structures on which to perch can increase the likelihood of collision with wind turbines (for example Percival, 2005 and references therein).
- 8.6.49 It should be noted that operational disturbance and collision risk effects are mutually exclusive in a spatial sense; a bird that avoids the wind farm area due to disturbance cannot be at risk of collision with the turbine rotors at the same time. However, they are not mutually exclusive in a temporal sense; a bird may initially avoid the wind farm but habituate to it and would then be at risk of collision.
- 8.6.50 Passerines nesting within a wind farm site would be expected to be regularly flying between wind turbines and could therefore be expected to be most at risk of collision. However, passerines tend to fly below PCH and evidence suggests that passerines collide with wind turbines infrequently. Collision is therefore mainly considered in relation to species of high sensitivity, for example, target raptor species and species not particularly manoeuvrable in flight, such as geese and swans.
- 8.6.51 VORs with sufficient flights within the CRZ at PCH (defined as a minimum of two flights and/or minimum of 10 individual birds per season of analysis) were subject to CRM and are considered at risk of collision with the proposed wind turbines at the Site. VORs that were subject to CRM are as follows:
- red kite
 - kestrel
 - peregrine
 - golden plover
- 8.6.52 For all other species, the number of flights within the CRZ at PCH was so low that that the collision risk is considered negligible and CRM was not warranted. This includes curlew, for which no flights were recorded within the CRZ during standard VP surveys (refer to **Table 8.4** and **Technical Appendix 8.5, Volume 4**) and lapwing, meaning that collision is also not likely to significantly affect any lapwing population within the Cefn Gelligaer, West of Deri SINC.

Red kite

- 8.6.53 Red kite is the second most often reported species in relation to collision with wind turbines in a published review from Germany. This review found that the collision risk is highest the closer the turbines are to a red kite nest. The collision risk is highest within 250 m of a nest, with the risk dropping by more than half every 250 m away from the nest, up to a distance of 1 km (Hotker *et al.*, 2006).

- 8.6.54 Red kite was the most frequently recorded raptor over the Site, with 204 flights recorded over the two years of survey. Of these, 66 individuals were recorded as flying through the CRZ at PCH, 57 individual birds during the breeding season and nine during the non-breeding season.
- 8.6.55 The recommended avoidance rate for red kite is 99 % (NatureScot, 2018). This was updated from the original avoidance rate of 98%, based on a study at the Braes of Doune Wind Farm site in Scotland, 4 km from a red kite release location (Urquhart, 2016).
- 8.6.56 The CRM for the Proposed Scheme, resulted in a predicted number of collisions / year of 0.1456 for the breeding season, 0.0315 for the non-breeding season and an annual mortality of 0.1718, equivalent to 5.83 years per collision (refer to **Technical Appendix 8.5, Volume 4**).
- 8.6.57 Background annual mortality for red kite is reported as 39 % for adults (BirdFacts, 2022). For a Welsh breeding population of 5,000 adults (2,500 pairs) the background rate of mortality equates to 1,950 adults per year in Wales. Additional mortality from the Proposed Scheme would be an additional 0.172 adults per year, which represents a relative increase of less than 0.01 % in adult mortality for the Welsh population. This is not significant at a national level and is considered unlikely to be significant at a regional, county or local level either.
- 8.6.58 Further to this, the background annual mortality for red kite in their first year is higher than for adults (50 %) (BirdFacts, 2022). Assuming a proportion of any mortality involves birds in their first year, the predicted annual increase in mortality of 0.172 birds would be even less significant.
- 8.6.59 Due to the small increase in adult mortality and that juvenile birds, with a higher background mortality could also be included in the mortality calculation reducing the population-level effect still further, **a significant negative effect on red kite is not likely**.

Kestrel

- 8.6.60 Over 500 kestrel collisions have been reported at European wind farms, although none of these were in GB (Dürr, 2019). Although there may be other, unpublished reports of collisions of this species, kestrel collisions nevertheless appear to be a relatively uncommon event in the UK.
- 8.6.61 The hovering behaviour of kestrel is thought to increase the species' vulnerability to wind turbine collisions (Barrios *et al.*, 2004, Marques *et al.*, 2014). This is reiterated by the fact that NatureScot have retained the default avoidance rate of 95 % for this species at the last review of such rates, where most species were elevated to 98 % (SNH, 2018c). This avoidance rate is an integral element of the collision risk modelling method (Band *et al.*, 2007).
- 8.6.62 The flights at risk height that were used for the CRM are from the breeding season 2019 and comprised a total of two flights involving single individuals, detailed in **Technical Appendix 8.1, Figure 3, (Volume 4)**. Assuming a 95 % avoidance rate, 0.0187 collisions per year were predicted (approximately one collision every 53.39 years).

- 8.6.63 Assuming a worst-case scenario that the mortality would involve breeding adults, the annual predicted collision mortality rate of 0.0187 represents considerably less than 0.01 % of the Welsh breeding population (3,500 adults, 1,750 pairs). Against background annual mortality of 31 % for adults (BirdFacts, 2022) equivalent to 1,085 adults per year in Wales, the predicted additional mortality from the Proposed Scheme represents a relative increase of less than 0.002 % in adult mortality. This is not significant at a national level and is considered unlikely to be significant at a regional, county or local levels either.
- 8.6.64 Further to this, the background annual mortality for kestrels in their first year is higher than for adults (68 %) (BirdFacts, 2022). Assuming a proportion of any mortality involves birds in their first year, the predicted annual increase in mortality of 0.0187 birds per year would have an even smaller effect on the kestrel population.
- 8.6.65 Due to the small increase in adult mortality and that juvenile birds, with a higher background mortality could also be included in the mortality calculation reducing the population-level effect still further, **a significant negative effect on kestrel is not likely.**

Peregrine

- 8.6.66 Thirty peregrine collisions have been reported at European wind farms, one of which was in the UK (Dürr, 2019). Although there may be other, unpublished reports of collisions of this species, peregrine falcon collisions nevertheless appear to be a relatively uncommon event.
- 8.6.67 The flights at risk at the Site comprised two flights of two individuals in the 2019 and 2020 breeding season and the non-breeding season in 2019/20 (refer to **Technical Appendix 8.5, Volume 4**).
- 8.6.68 The CRM for the Proposed Scheme resulted in a predicted number of collisions / year of 0.0037 for the breeding season, 0.0077 for the non-breeding season and an annual mortality of 0.0116, equivalent to 86.01 years per collision (refer to **Technical Appendix 8.5, Volume 4**). Due to the low predicted rates of collision, **a significant negative effect on peregrine is not likely.**

Golden plover

- 8.6.69 Thirty-nine golden plover collisions have been reported at European wind farms, none of which were in the UK or Ireland (Dürr 2019). Although there may be other, unpublished reports of collisions of this species, golden plover collisions nevertheless appear to be a relatively uncommon event.
- 8.6.70 The flights recorded through the CRZ at PCH within the Proposed Scheme for golden plover included two flights of a total of 282 individuals in the non-breeding season in 2019 (all recorded on 26/11/19, to the east of the Site) and two flights of five individuals in August during the non-breeding season in 2020.
- 8.6.71 The CRM for the Proposed Scheme, assuming an avoidance rate of 98 % resulted in a predicted number of collisions / year of 0.631 for the breeding season and an annual mortality of 0.6641, equivalent to 1.51 years per collision (refer to **Technical Appendix 8.5, Volume 4**).

- 8.6.72 Background annual mortality for golden plover is reported as 27 % for adults (BirdFacts, 2022). Against a GB breeding population of 32,500-50,500 pairs this equates to a minimum of 17,550 adults per year in GB. Additional mortality from the Proposed Scheme would be an additional 0.66 adults per year, which represents a relative increase of 0.004 % in adult mortality for the GB population. Such an increase in background mortality is not significant at a national level and is considered unlikely to be significant at a regional, county or local level either. As such, **no significant effects on golden plover are likely.**

Aviation lighting

- 8.6.73 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).
- 8.6.74 Artificial light can impact birds in many ways, however phototaxis – attraction to light, has the greatest potential to have a negative effect in this situation. Although the exact mechanism of the attraction to artificial light is unknown, interference with the magnetic compass of birds (Poot *et al.*, 2008) or navigation by moonlight (Rodriguez *et al.*, 2016), are most likely.
- 8.6.75 NatureScot (2020) highlight that the species most at risk from collision with lit wind turbines are burrowing nesting seabirds and nocturnally migrating passerines. The proposed scheme is located over 30 km from the coast, therefore impacts on burrowing seabirds are not likely here and are not considered further.
- 8.6.76 Mortality rates at illuminated wind turbines have been studied in North America, although there are very few European and even less UK examples of such research. Kerlinger *et al.*, 2010 studied night migrant fatalities at 30 North American wind farms and concluded that nocturnal migrating bird mortality was low, from less than one to seven individuals per turbine per year. Most of the wind farms included in the study had aviation lights, though not all turbines were lit. Mortalities in general were lower at wind farms compared to communications towers. This is likely to be due to communications towers being greater in height than turbines, extending into altitudes where most nocturnal migrants fly and being constructed with guy wires that are less easily observed by flying birds.
- 8.6.77 The few UK/European studies available are based on offshore wind farms, these found that terrestrial birds may be attracted to illuminated offshore structures at night, therefore there is a greater collision risk (Huppopp *et al.*, 2006). The comparison of onshore and offshore turbines has limited merit however, as birds generally fly lower over the sea than on land (Kruger and Garthe 2001), increasing collision risk. Furthermore, offshore structures may offer a place of rest for migrant species in an area of limited opportunity (the open sea), whereas there are plentiful resting places in the vicinity of an onshore wind farm.

- 8.6.78 With regard to nocturnally migrating passerines, there are no geographical features which suggest the Site may lie on a significant migratory flight path and this is supported by diurnal bird survey data collected between April 2019 and March 2021, which found no evidence of significant numbers of migratory passerines regularly overflying the Site during the day. Given their high background mortality rates and high reproductive rates, mortality of migratory passerines would need to be substantial to affect bird populations. Based on the above and given that mortality suggested by North American research is relatively low, **no significant effects are likely** as a result of the proposed aviation lighting.

Decommissioning Phase Effects

Potential Effects

- 8.6.79 Potential effects associated with decommissioning of the Proposed Scheme are assumed to be similar to, albeit somewhat reduced to those identified for construction phase (potentially including disturbance/displacement but not habitat loss).
- 8.6.80 Due to the length of the operational period (35 years), the future composition of the bird community at the Site is not known and the confidence in any predictions would be uncertain.
- 8.6.81 In the absence of mitigation, activities carried out during the decommissioning phase could cause short-term effects through disturbance. 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 on important bird species, would be implemented during decommissioning. Following the implementation of these measures **no significant effects are likely**.

8.7 Grid Connection

- 8.7.1 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.
- 8.7.2 Effects on birds are possible during the construction of the grid connection, particularly if it takes place during the breeding season. However, the ornithological survey area covered the likely grid connection route and no breeding waders or breeding raptors were recorded in the vicinity of the likely grid connection route during the surveys undertaken in 2019 and 2020. Provided that standard good practice measures, similar to those proposed for the Proposed Scheme in Section 8.6, are implemented to avoid damage to nests, **no significant effects are likely** during construction.
- 8.7.3 It is assumed that the grid connection will be underground and therefore no effects on bird species are likely during the operational period.
- 8.7.4 It is assumed that cables would be left in the ground on decommissioning of the wind farm and therefore no effects on bird species are therefore anticipated during decommissioning.

8.8 Additional Mitigation, Compensation and Enhancement

Construction and decommissioning

- 8.8.1 No further mitigation measures, additional to the primary and additional mitigation measures set out in paragraphs 8.6.4 to 8.6.11, are considered necessary during the construction or decommissioning stages.
- 8.8.2 Compensation for the loss of habitats within the Site, and additional biodiversity enhancement, would be provided via the restoration of heathland, peatland and other upland habitats, both on and off-site, via the Habitat Management Plan (HMP) (see **Technical Appendix 7.6: Outline HMP for further details, Volume 4**). In time (within a few years) the restored habitats, both on and off-site, have the potential to improve habitat quality for a range of bird species.

Operation

- 8.8.3 The potential to provide beneficial measures for curlew and snipe within the Site is limited due to the majority of the Site being actively grazed common land. The Applicant has therefore located an off-site habitat management area, on land owned by Dŵr Cymru Welsh Water (DCWW) adjacent to the Site to the east. Proposed management for curlew within the off-site management area is summarised below (for full details refer to the OHMP (**Technical Appendix 7.6, Volume 4**)):
- Habitat management and restoration of heathland, via controlling grazing density and management of tall vegetation outside the breeding season—specifically dense stands of rushes and dominant grasses;
 - Restoring wet ground and peatland via ditch blocking drains;
 - Predator control, specifically between February and July during and immediately prior to the breeding season; and
 - Temporary electric fencing of curlew nests to prevent predation.
- 8.8.4 Any compensation measures designed for curlew are likely to also benefit snipe, as these species utilise similar breeding habitat, therefore any compensation and enhancement should benefit both species.

8.9 Monitoring

- 8.9.1 Due to the potentially significant effects that are likely in relation to disturbance/displacement of breeding waders (curlew and snipe) during operation of the Proposed Scheme, post-construction monitoring for breeding waders is proposed. The primary aims of the proposed monitoring are to validate the predictions made in the ES and to determine whether the management of the proposed off-site management area has been successful. It would potentially also highlight the need for additional compensation measures, if either species (curlew or snipe) is subject to greater displacement than predicted (provided such displacement can be attributed to the Proposed Scheme).

- 8.9.2 As the most recent survey for breeding waders was undertaken in 2020, updated baseline monitoring covering the Site and off-site management area, plus a buffer zone of up to 500 m, would take place during the breeding season before construction commences to provide up to date information against which to compare the results of post-construction monitoring. Further surveys would then take place during construction and annually for at least three years post-construction, with the need for further monitoring subject to review at the end of Year 3.
- 8.9.3 All surveys would follow the methodology used in 2019 and 2020, as outlined in **Technical Appendices 8.1 and 8.3 (Volume 4)** to enable comparability of data. Results would also be compared with results for other similar sites in Wales (subject to data availability) with the aim of comparing results with wider trends.
- 8.9.4 Within the proposed off-site management area more detailed surveys for curlew would be undertaken to identify nest locations and enable the installation of predator fencing, as detailed in Cri'r Gylfinir/ Curlew LIFE (undated) guidance. These surveys would also seek to determine productivity from each nest recorded and would also note other wader nest locations recorded incidentally. These surveys would take place annually for the lifetime of the wind farm (noting that surveys would cease if curlews were no longer present, or numbers recovered sufficiently that nest monitoring was no longer essential to maintain the population).

8.10 Summary of Effects

Construction

- 8.10.1 The following effects on VORs were assessed:

Nest damage or destruction

- 8.10.2 Following the implementation of mitigation, **no significant negative effects are likely** during the construction or decommissioning phases of the Proposed Scheme.

Habitat Loss

- 8.10.3 Effects of direct habitat loss were assessed for the following VORs, as these species were identified as breeding within or adjacent to the Site:

- curlew
- snipe

- 8.10.4 **No significant effects are likely** for either species following the implementation of mitigation.

Disturbance/displacement during construction

- 8.10.5 Construction disturbance/displacement effects were assessed for the following VORs:

- curlew
- snipe
- red kite

- common sandpiper

8.10.6 **No significant effects are likely** for any of the species assessed following the implementation of mitigation.

Operation

8.10.7 The following effects on VORs were assessed:

Barrier effects

8.10.8 **No barrier effects** during operation of the Proposed Scheme were identified for VORs.

Displacement/Disturbance during operation

8.10.9 Operational disturbance/displacement effects were assessed for the following VORs:

- curlew
- snipe
- red kite

8.10.10 The following significant effects are likely:

- A **significant negative effect** on breeding curlew at a regional level.
- A **significant negative effect** on breeding snipe at a county level.

8.10.11 **No significant effects are likely for red kite.**

8.10.12 The Applicant is proposing to provide off-site compensation on land owned by (DCWW adjacent to the Pen March site boundary to the east for the potential disturbance and displacement of breeding curlew during wind farm operation. Proposed measures include: habitat management, restoring wet ground and peatland, predator control and temporary electric fencing of curlew nests. The proposed compensation measures will **offset the predicted significant effects on curlew and will also provide additional biodiversity enhancement**. Compensation and enhancement measures designed for curlew are likely to also benefit snipe and would therefore also **offset predicted significant effects on snipe**.

8.10.13 Post-construction monitoring of breeding waders is also proposed within the Site and proposed off-site management area, following the methodology undertaken previously. Detailed monitoring of curlew will also be undertaken on the off-site management area, specifically to identify nests.

Collision with Wind Turbines

8.10.14 Collision mortality was assessed for the following VORs which had sufficient flight activity data to warrant undertaking collision risk modelling:

- red kite
- kestrel
- peregrine
- golden plover

8.10.15 For all species the predicted mortality rate is **not likely to be significant**.

Post-Operational Stage Effects (Decommissioning)

8.10.16 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 on important bird species, would be implemented during decommissioning. Following the implementation of these measures no significant effects are likely.

8.11 References

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