



Chapter 7

Ecology and Biodiversity

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Chapter 7

7 Ecology and Biodiversity

7.1 Introduction

7.1.1 Chapter Objectives

1. This chapter reports the outcome of the assessment of likely significant effects on ecology and biodiversity associated with the construction and operation of the Proposed Development. It should be read with reference to **Chapter 3: Site Selection and Design** and **Chapter 4: Development Description** as well as other chapters referenced throughout. Together with **Appendices 7.1 to 7.6** and **Chapter 8: Ornithology**, this chapter completes the assessment of effects from the Proposed Development on ecology and biodiversity. The objectives of this Chapter are to:
 - describe the ecological baseline conditions and trends if the Proposed Development were not to progress;
 - describe the criteria used to evaluate ecological features of interest;
 - describe the criteria used to assess the significance of effects arising from the impacts of the Proposed Development;
 - identify and describe the potential effects, including direct, indirect and cumulative effects;
 - describe the mitigation measures proposed to address predicted significant effects;
 - assess the residual effects remaining following the implementation of mitigation; and
 - identify opportunities for enhancement.
2. Information on the ecology and biodiversity assessment methodology and the baseline conditions relevant to this assessment, as well as a summary of the predicted significant effects leading to the additional mitigation measures, where required to avoid, reduce or offset any likely significant adverse effects, are presented in this chapter. Any likely significant residual effects and any required monitoring after these measures have been employed, are also presented along with enhancement measures proposed.
3. **Appendix 4.1 Offsite Access Appraisal** considers the potential effects on ecology and biodiversity as a result of the proposed offsite access route to the Site, concluding that there would be no potential significant effects likely to occur as a result of the offsite access route upgrade works and as a result, this has not been assessed further within this chapter.
4. The description of other elements of infrastructure of the Proposed Development assessed in this chapter can be found on **Figure 4.1 Site Layout** and **Chapter 4: Development Description**. The ecology and biodiversity aspects of the Site selection and design are described in full in **Chapter 3: Site Selection and Design**.
5. Issues relating to groundwater dependent terrestrial ecosystems (GWDTEs) and peat are not included within this chapter unless relevant for nature conservation, although the habitats associated with the Proposed Development with the potential to be groundwater dependent are identified in **Appendix 7.2: Habitats Baseline Report**. Otherwise, GWDTEs are only included within **Chapter 6: Hydrology, Hydrogeology, Geology and Soils**.
6. For clarity, the following terminology has been used within this chapter and is defined as follows:
 - 'The Proposed Development' – the proposed Carrick Windfarm, Energy Storage Facility¹ and associated infrastructure;

¹ Subject to landowner agreement

² It is anticipated that SPP 14 will be replaced by National Planning Framework 4 during 2021.

- 'The Site' – the overall parcel of land incorporating the Scoping Layout: Design Iteration A (**Chapter 3: Site Selection and Design**). The Site is demarcated by 'the Site Boundary'; and
- 'The Proposed Development Area' – the area within which the final design iteration is contained, comprising the area enclosed by the outermost wind turbines, access roads and other associated infrastructure.

7.1.2 Supporting Documents

7. This chapter was informed by the following appendices and their associated figures:

- **Appendix 7.1 Ecology Baseline Report;**
- **Appendix 7.2 Habitats Baseline Report;**
- **Appendix 7.3 Bat Survey Report;**
- **Appendix 7.4 Bat Mitigation Plan;**
- **Appendix 7.5 Aquatic Ecology Baseline Report;** and
- **Appendix 7.6 Outline Habitat Management Plan.**

7.2 Legislation, Policy and Guidance

7.2.1 Legislation

8. The applicable legislative framework is as follows:

- European Union Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora 1992 (the Habitats Directive);
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (the Habitats Regulations) which transposes requirements of the Habitats Directive in Scotland, and The Conservation of Habitats and Species Regulations (2017) with regards to reserved matters, including consents granted under Sections 36 and 37 of the Electricity Act 1989;
- The Wildlife and Countryside Act 1981 (as amended);
- The Electricity Act 1989;
- The Protection of Badgers Act 1992 (as amended);
- The Wildlife and Natural Environment Act (Scotland) Act 2011 (as amended);
- Nature Conservation (Scotland) Act 2004 (as amended);
- Protection of Wild Mammals (Scotland) Act 2002;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended); and
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

7.2.2 Policy

9. The following policy documents have been considered in defining the scope of the assessment presented in this chapter. Further detail is provided in relevant appendices:
 - Scottish Planning Policy 2014 (SPP 14)²;
 - Scottish Planning Policy on Renewable Energy;
 - South Ayrshire Local Development Plan (South Ayrshire Council, 2014);
 - Scottish Biodiversity Strategy (SBS)³;
 - Scottish Biodiversity List (SBL);
 - Policy Statement No. 02/02: Strategic Locational Guidance for Onshore Wind Farms in Respect of Natural Heritage; and
 - Ayrshire Local Biodiversity Action Plan (ALBAP).

³ It is anticipated that the SBS will be updated during 2021.

7.2.3 Guidance

10. The following guidance documents have been used during the preparation of this chapter:
- British Standards Institute (BSI) (2013) 42020:2013 Biodiversity. Code of practice for planning and development;
 - Chartered Institute of Ecology and Environmental Management (CIEEM) (2017). Guidelines for Preliminary Ecological Appraisal (PEA).
 - CIEEM (2017). Guidelines for Ecological Report Writing.
 - CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland, Terrestrial, Freshwater, Coastal and Marine;
 - CIEEM (2019). Advice Note on the Lifespan of Ecological Surveys and Reports;
 - European Commission (2018). Managing Natura 2000 Sites, the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC;
 - Hill, D., Fasham, M., Tucker, G., Shewry, M. and Shaw, P. (2005). Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring;
 - Institute of Environmental Assessment (IEMA) (1993). Guidance Note Number 1;
 - IEMA (2015). Environmental Impact Assessment Guide to Shaping Quality Development;
 - Scottish Executive (2012) River crossings & migratory fish: Design guidance;
 - Scottish Natural Heritage (SNH)⁴ (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments;
 - SNH and Historic Environment Scotland (2018). A Handbook on Environmental Impact Assessment (EIA); and
 - Scottish Renewables, SNH, Scottish Environment Protection Agency, Forestry Commission Scotland⁵, Historic Environment Scotland, Marine Scotland Science and Association of Environmental Clerk of Works (2019). Good Practice during Wind Farm Construction.
11. Construction Industry Research and Information Association (CIRIA) guidance has been referred to along with Scottish Environment Protection Agency (SEPA) (jointly with the Environment Agency and the Northern Ireland Environment Agency), Pollution Prevention Guidelines (PPG) and Guidance for Pollution Prevention (GPP) with regard to good practice construction measures, environmental protection and pollution prevention. Details of the relevant CIRIA guidance, PPGs and GPPs are listed in **Chapter 6: Hydrology, Hydrogeology, Geology and Soils**.
12. Baseline surveys completed to inform this assessment have been carried out in accordance with good practice survey guidelines where applicable and are referenced within the appendices.

7.3 Consultation

7.3.1 Scoping

13. To ensure a comprehensive understanding of the potential ecological issues associated with the Proposed Development and to inform survey methodology and assessment, various stakeholders were contacted for information and comment on the proposed scope of assessment through desk study consultations as well as a through an EIA Scoping Report (WSP, 2020) as discussed in **Chapter 2: EIA Process and Methodology**. **Table 7.1** provides the results of the Scoping exercise and describes any subsequent responses or actions if required.

Consultee	Date	Response	Action
Ayrshire Rivers Trust (ART), River Stinchar District Salmon Fishery Board (DSFB) and River Girvan DSFB	14 July 2020	ART confirmed that the Proposed Development has the potential to have an impact on the water environment due to its close proximity to important tributaries	Appropriate fish and FWPM surveys have been undertaken and are reported within Appendix 7.5 Aquatic

⁴ Formerly known as Scottish Natural Heritage (SNH), rebranded to ‘NatureScot’ as of 24 August 2020. Documents published by NatureScot prior to this date are referenced as SNH.

Consultee	Date	Response	Action
		<p>of the River Stinchar and Water of Girvan.</p> <p>ART advised the following:</p> <ul style="list-style-type: none"> • fish and aquatic invertebrate surveys should be established prior to construction and data should be collected throughout construction activities and during operation to allow for a full dataset to be collated and resulting impacts to be monitored; and • the Water of Girvan fish and freshwater pearl mussel (FWPM) <i>Margaritifera margaritifera</i> population should be considered during planning and construction and monitoring should be undertaken, if required. In separate but associated e-mail correspondence, ART confirmed that there are no known FWPM populations within the River Stinchar and so the species could be removed from consideration for this catchment. <p>ART request that the following potential effects are considered during the assessment:</p> <ul style="list-style-type: none"> • forest felling and subsequent effects, such as: acidification of watercourses, rates of surface drainage run-off, sediment-laden surface draining water, input of hydrocarbons; • any impediment to fish movement through construction activities. New water crossings (both temporary and permanent) should comply with SEPA’s design and best practice; and 	<p>Ecology Baseline Report. Aquatic invertebrate surveys were not conducted to inform the impact assessment but are instead recommended to be undertaken prior to the commencement of construction.</p> <p>Fish monitoring details are provided in Section 7.6.4.</p> <p>The listed potential effects listed by ART are considered within this chapter or other relevant chapters within the Environmental Impact Assessment Report (EIAR).</p>

⁵ Formerly known as Forestry Commission Scotland (FCS), rebranded to Scottish Forestry, documents published by FLS prior to this are referenced as FCS.

Consultee	Date	Response	Action
		<ul style="list-style-type: none"> potential impacts from soil stripping, track construction and vehicle/plant movements, dewatering on receptor watercourses and abstraction of water from watercourses. 	
Crosshill, Straiton and Kirkmichael Community Council (CSKCC)	25 June 2020	<p>CSKCC strongly believe that terrestrial invertebrates should not be ignored/dismissed, and that it is not acceptable that degradation of Linfern Loch could be permanent.</p> <p>The consultation with relevant bodies and field surveys need to be robust and not just walkovers. People who work in these forests know a lot about the life in them and should also be consulted.</p> <p>Any forest plan would be looking at enhancement of habitat/environment. For example, Linfern Loch would be studied as an important habitat. Because of the time that loch has been in existence the habitat surrounding it is natural and supports a wealth of different forms which make up its ecosystem. There are many forms of invertebrates dependent on such a habitat and these invertebrates are the attraction for the bird life and bats which feed on them. Harming this habitat in any way or form would not only affect the ground and flora but would have a major knock on effect on a whole range of creatures. Therefore, it is important to carry out a proper study of this area and also a proper study of terrestrial invertebrates.</p>	<p>Terrestrial invertebrates are considered in Section 7.5 of this chapter.</p> <p>Any potential adverse effects upon Linfern Loch in the Scoping Report were made on a precautionary basis prior to the establishment of a finalised development design and predicted in the absence mitigation. The Proposed Development is sufficiently set back from Linfern Loch (approximately 250m) and the implementation of standard pollution prevention measures are predicted to avoid any significant adverse effects on this receptor.</p> <p>A thorough programme of consultation with relevant statutory and non-statutory nature conservation organisations and ecological field surveys have been undertaken to inform the Ecological Impact Assessment.</p> <p>Ecological field surveys have not included Linfern Loch specifically as it is located sufficiently far away from the Proposed Development (approximately 250m) such that there are not predicted to be any significant adverse effects upon it or its associated flora and fauna.</p>
Daily Community Council (DCC)	06 July 2020	There has to be rigorous field surveys as well as desk study for both ecology and ornithology.	A thorough programme of consultation with relevant statutory and non-statutory nature conservation organisations and ecological

Consultee	Date	Response	Action
			field surveys have been undertaken to inform the EIA.
Galloway Fisheries Trust (GFT)	21 May 2020	GFT noted that the Proposed Development lies to the north of the River Cree catchment and that the red line boundary touches the Water of Minnoch, the main tributary of the River Cree, and also lies immediately adjacent to the Pilnyark Burn, a tributary of the Water of Minnoch. It was acknowledged however, that the location of the Proposed Development is well away from the River Cree catchment. However, should the Proposed Development move further to the south, closer to the Cree catchment, GFT and River Cree DSFB should be consulted.	The Proposed Development does not encompass watercourses associated with the River Cree catchment. Consequently, there are no predicted impacts on watercourses within this catchment, or requirement to consult with GFT or River Cree DSFB further in relation to the Proposed Development.
Galloway and Southern Ayrshire Biosphere (GSAB)	10 July 2020	GSAB confirmed that the assessment should consider those habitats and species documented within their Natural Heritage Management Plan (GSAB, 2018), specifically, water vole <i>Arvicola amphibius</i> , red squirrel <i>Sciurus vulgaris</i> , and brown trout <i>Salmo trutta</i> , in addition to; blanket and raised bogs.	This chapter has considered those species and habitats listed within the Natural Heritage Management Plan.
Marine Scotland Science (MSS)	27 May 2020	<p>MSS highlight the following to consider during the assessment:</p> <ul style="list-style-type: none"> the River Stinchar and Water of Girvan support important Atlantic salmon <i>Salmo salar</i> and trout populations; acidification is a known problem in the area; the potential impact on the water quality and aquatic biota associated with forestry operations; and the potential cumulative impact on the water quality and aquatic biota as a result of the present proposal and developments which have hydrological connectivity with the proposed windfarm. 	The listed items are included within this chapter or other relevant chapters within the EIAR, such as Chapter 6: Hydrology, Hydrogeology, Geology and Soils , and consultation has continued with ART and associated DSFBs.

Consultee	Date	Response	Action
Scottish Forestry	26 June 2020	<p>Scottish Forestry expect that the volume of woodland proposed for removal would require compensatory planting.</p> <p>Scottish Forestry request all felling and restocking proposals must be compliant with the UK Forestry Standard (Forestry Commission, 2017).</p> <p>Scottish Government's policy on control of woodland removal: implementation guidance (Annex 1) (Scottish Government, 2019) should be consulted during EIA production.</p> <p>Scottish Forestry advise that compensatory planting may need to be considered under the Forestry Regulations 2017.</p>	<p>Forestry is covered in Chapter 13: Other issues. Felling and restocking plans are compliant with the UK Forestry Standard.</p> <p>Compensatory planting calculations have been undertaken following Annex 5 of the Scottish Government's policy on the control of woodland removal.</p> <p>Response relating to the Forestry EIA Regulations noted.</p>
SEPA	22 June 2020	<p>SEPA had the following comments with specific relevance to this chapter:</p> <ul style="list-style-type: none"> A National Vegetation Classification (NVC) survey should be undertaken to highlight areas with GWDTE. <p>As such, the following information has been requested:</p> <ul style="list-style-type: none"> GWDTEs are mapped to demonstrate avoidance measures; where micro-siting is considered as a mitigation measure, the survey distance should be extended appropriately; and a detailed qualitative and/or quantitative risk assessment would be required where minimum recommended buffers are not achievable. 	<p>An NVC survey was completed and potential GWDTE habitats are identified in Appendix 7.2 Habitats Baseline Report where applicable and assessed in Chapter 6: Hydrology, Hydrogeology, Geology and Soils.</p>
NatureScot ⁶	18 June 2020	NatureScot confirmed that Merrick Kells Special Area of Conservation (SAC), located	Comments noted with regards to the scoping-out of the mentioned designations. Otter

Consultee	Date	Response	Action
		<p>approximately 7km south east of the Survey Area, can be scoped-out of the EIA with regards to qualifying features; upland habitat and freshwater habitats. Notwithstanding, NatureScot reserve judgement on otter <i>Lutra lutra</i> (a secondary qualifying feature) until full survey findings have been provided and considered during the assessment.</p> <p>NatureScot agreed that Merrick Kells Site of Special Scientific Interest (SSSI), Auchalton SSSI and Bogton Loch SSSI (outwith the 'Ecological Zone of Influence' [EZOI]) can be scoped out of the EIA due to the absence of connectivity between the SSSIs and the Site.</p> <p>NatureScot advised that the following protected species/protected species surveys should be considered during the assessment, in line with relevant good practice guidelines:</p> <ul style="list-style-type: none"> otter; including any potential association with Merrick Kells SAC; bats; roost surveys and activity surveys; GCN <i>Triturus cristatus</i>; water vole; badger <i>Meles meles</i>; red squirrel; pine marten <i>Martes martes</i>; and fish and FWPM. <p>Species-specific protection plans should be prepared if the survey work finds that a protected species may be affected by the Proposed Development. Where</p>	<p>as a qualifying feature of Merrick Kells SAC have also been scoped-out of this assessment based on absence of habitat connectivity following further investigation, as detailed in Section 7.3.1.1. However, otter is still considered as an Important Ecological Feature (IEF) in their own right within this EIAR.</p> <p>All protected species highlighted by NatureScot have been surveyed for and assessed, where applicable, in line with relevant good practice guidelines. Additional consultation was undertaken with NatureScot on the extent of the GCN survey area (17 August and 24 September 2020). Ultimately, all ponds within 500m of the Proposed Development Area were inspected and surveyed and NatureScot confirmed that this was in line with their recommendations and survey guidance (09 October 2020).</p> <p>Where appropriate, species specific protection plans would be incorporated within the Construction Environmental Management Plan (CEMP) and licensing would be applied for from NatureScot where necessary.</p> <p>Forestry and Land Scotland (FLS) confirmed that both red and roe deer are present within the Site at medium density. However, the limited footprint of the Proposed Development, keyhole felling for some wind turbine locations and the absence of extensive (multiple coupe) clear-felling and hence</p>

⁶ Formerly known as Scottish Natural Heritage.

Consultee	Date	Response	Action
		<p>mitigation measures are not sufficient to avoid offences under protected species legislation, a licence should be sought from NatureScot before works can proceed.</p> <p>It has been recommended that, if deer are present, an assessment of the potential impacts on deer welfare, habitats, neighbouring and other interests (e.g. access and recreation, road safety, etc.) should be presented and a deer management statement should be prepared, if applicable.</p> <p>NVC survey results should be mapped with the Development Footprint layout overlapping. Records of any rare or scarce plant species should be included within the EIA Report.</p> <p>Finally, NatureScot recommend continued consultation with FLS regarding requirements for compensatory planting according to Scottish Government policy (Scottish Government, 2019).</p>	<p>negligible potential for associated deer displacement means that potential construction and operational impacts are not predicted to be significant and as such, deer are not considered as an IEF. Notwithstanding, embedded mitigation (Section 7.6.4) would safeguard animal welfare on Site throughout all stages of development.</p> <p>This chapter and Appendix 7.2 Habitats Baseline Report contains information on NVC surveys and makes note of any notable plant species, if applicable.</p> <p>Forestry is covered in Chapter 13: Other issues.</p>
East Ayrshire Council (EAC)	27 August 2020	EAC confirmed that they are broadly content with the approach proposed to be taken to ecology.	Comments acknowledged.
South Ayrshire Council	16 September 2020	<p>South Ayrshire Council are in agreement with NatureScot's scoping response that otter, as a qualifying feature of Merrick Kells SAC should be considered further and that they are agreement to scope out all other identified statutory designated sites surrounding the Site.</p> <p>South Ayrshire Council advice reflects that of NatureScot with regards to the consideration of protected species surveys and assessment.</p>	<p>Comments noted with regards to the scoping-out of the referenced designations. Otter as a qualifying feature of Merrick Kells SAC have been scoped-out of this assessment, however otter is still considered further within this EIAR.</p> <p>All protected species highlighted by NatureScot have been surveyed for and assessed, where applicable, in line with relevant good practice guidelines.</p>

Consultee	Date	Response	Action
		<p>South Ayrshire Council advise that mitigation for bats include the expectation that no part of a wind turbine structure is located within 50m of any building, tree or hedgerow.</p> <p>A deer management statement may be required if deer are present or if deer are utilising the Site.</p> <p>South Ayrshire Council support the intention to undertake NVC surveys within 250m of each wind turbine location, access routes and borrow pit search areas.</p>	<p>A minimum distance of 50m between any building or natural feature which has the potential to be utilised by bats has been achieved during the Proposed Development design.</p> <p>Deer are present within the Proposed Development Area, however potential construction and operational impacts are assessed as not significant to deer. Notwithstanding, embedded mitigation would safeguard animal welfare on Site throughout all stages of development.</p> <p>This chapter and Appendix 7.2 Habitats Baseline Report contains information on NVC surveys.</p>

Table 0.1 Consultation Responses

7.3.1.1 Scoped-Out Ecological Features

- With reference to scoping responses from key stakeholders as described in **Table 7.1**, Merrick Kells SAC/SSSI has been scoped-out of further consideration within this chapter. This designation is located approximately 6.7km from the Site and there is an absence of known pathways, including hydrological. Consequently, there are no potential impacts on the associated qualifying habitats (upland and freshwater habitats), which NatureScot agreed with in their scoping response.
- Otter is also a qualifying feature of Merrick Kells SAC. However, although otter activity was identified primarily within the eastern parts of the Otter Survey Area (defined in **Section 7.4.3**), the closest notable waterbody of the designation is Loch Macaterick, located 6.7km south east of the Site. While otters can occupy a large home range, with the exception of approximately 14km of convoluted forestry roads and main roads, there is no direct connectivity between the Site, the wider Survey Area and the SAC, specifically there is no hydrological connection. Consequently, there are no potential impacts on the otter population associated with this SAC. Notwithstanding this, otter activity within the Otter Survey Area in relation to the Proposed Development will still be considered further within this assessment.

7.4 Assessment Methodology and Significance Criteria

7.4.1 Method of Baseline Data Collection

- Baseline data were collected across various survey areas (defined below in **Section 7.4.3**) encompassing the EZoI of the Proposed Development. The EZoI for the Proposed Development is the area over which ecological features may be affected by biophysical changes as a result of the Proposed Development and associated activities. The

EZol varies for different ecological features depending upon their sensitivity to an environmental change and informs the survey boundaries recommended in guidance documents cited in this chapter or the relevant appendix.

7.4.2 Ecological Desk Study

17. The desk study was undertaken as reported in **Appendix 7.1 Ecology Baseline Report** and consisted of a review of existing ecological baseline information obtained from the public domain and relevant third parties to identify the presence of statutory and non-statutory nature conservation sites, ancient woodland and legally protected or otherwise notable species (for example, those species of conservation concern described within the ALBAP and the SBL). The following search areas were used:

- statutory designated sites of European or international importance within at least a 10km radius of the Site, i.e. SACs, Ramsar sites.;
- statutory and non-statutory designated sites of national to local importance within at least a 2km radius of the Site. Statutory sites of national importance include Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR), while non-statutory designated sites include Local Wildlife Sites (LWS) and Sites of Importance for Nature Conservation (SINC);
- records of legally protected and notable species within at least a 2km (up to 10km for bats) radius of the Site; and.
- ancient woodland within at least a 2km radius of the Site.

7.4.3 Field Studies

18. Initial Habitat Suitability Assessments were undertaken throughout the initial developable area which was identified to inform the early stages of the development process and which was referred to in the EIA Scoping Report (WSP, 2020); hereafter referred to as the 'Scoping Developable Area'. GCN surveys were completed throughout the Proposed Development Area and surrounding buffer of 500m while bat activity surveys were designed on an initial indicative wind turbine layout in which 18 wind turbines were originally being considered, this has since been reduced to the 13 wind turbines under consideration.

19. With the exception of GCN and bats, all remaining species-specific and habitat survey areas evolved in response to design iterations, to ensure minimum survey areas, as defined by guidance documents, were covered in relation to the Final Design Layout (described in **Chapter 3: Site Selection and Design**). Hence, in the following sections, survey areas are presented as 'a minimum distance' from the Proposed Development Area. The scale and location of the Proposed Development is described in **Chapter 4: Development Description** and surveys areas around proposed infrastructure were as follows:

- wind turbine locations and borrow pit search areas: a minimum buffer of 100m for fauna where suitable habitat was present for notable and protected species, increased to a minimum of 200m for riparian mammals, 250m for habitats and 500m for FWPM;
- access roads and other infrastructure: a minimum buffer of 100m for habitats and for fauna where suitable habitat was present for notable and protected species, increased to a minimum 200m for riparian mammals; and
- watercourse crossing points: 200m fish habitat suitability surveys upstream and downstream and FWPM surveys 100m upstream and 500m downstream.

20. For clarity, the following ecological survey areas are defined as follows:

- 'Protected Species Survey Area' – the Proposed Development Area plus a surrounding buffer for 100m applied in surveys for badger, water vole, pine marten and red squirrel;
- 'Otter Survey Area' – the Proposed Development Area plus a surrounding buffer for 200m applied in surveys for otter;

- The 'Bat Potential Roost Feature (PRF) Survey Area' – the area enclosed by the outermost wind turbines and their 75m rotor blades plus a surrounding buffer for 200m, as well as a 100m buffer around access tracks and other infrastructure applied for surveys of bat PRFs;
- The 'National Vegetation Classification (NVC) Survey Area' – the area enclosed by the outermost wind turbines and borrow pits plus a surrounding buffer for 250m, as well as a 100m buffer around access tracks and other infrastructure applied for NVC surveys; and
- The 'Great Crested Newt (GCN) Survey Area' – the Proposed Development Area plus a surrounding buffer for 500m applied in surveys for GCN.

21. The following surveys were conducted with detailed methodologies presented in relevant appendices:

- Protected Species Habitat Suitability Assessments: **Appendix 7.1 Ecology Baseline Report** and **Figures 7.1.5a – 7.1.5e**;
- NVC: **Appendix 7.2 Habitats Baseline Report** and **Figures 7.2.1 – 7.2.3**;
- Fish Habitat Suitability Walkover, Electrofishing and FWPM surveys: **Appendix 7.5 Aquatic Ecology Baseline Report** and **Figure 7.5.1**;
- Dedicated Badger, water vole, otter, red squirrel and pine marten surveys: **Appendix 7.1 Baseline Ecology Report** and **Figure 7.1.6 Protected Species Survey Results**;
- Bats: Potential Roost Feature (PRF) surveys: **Appendix 7.1 Baseline Ecology Report**, and automated static detector surveys **Appendix 7.3 Bat Survey Report** and **Figures 7.3.1 – 7.3.5**;
- GCN Habitat Suitability Index (HSI), environmental (e)DNA and presence/absence surveys: **Appendix 7.1 Baseline Ecology Report**; and
- Incidental records of other notable or legally protected species were recorded as well as areas of habitat considered suitable to support them, e.g. reptiles, amphibians, deer, brown hare *Lepus europaeus*, mountain hare *Lepus timidus*, European hedgehog *Erinaceus europaeus* and terrestrial invertebrates. Any evidence of invasive non-native species (INNS) flora and fauna was recorded during all surveys conducted, e.g. grey squirrel *Sciurus carolinensis*: **Appendix 7.1 Baseline Ecology Report** and **Figure 7.1.7 Incidental Species Records**.

22. All lead surveyors were members of CIEEM who were deemed to be at least 'Capable' in leading their survey element, according to CIEEM's survey competency framework⁷ and held appropriate licences as required.

7.4.4 Evaluation Methods for Ecological Features

23. All ecological features recorded were assigned a level of importance for nature conservation in accordance with CIEEM guidelines (CIEEM, 2018). The 'importance' of all ecological features has been determined on a geographical scale using criteria and examples shown in **Table 7.2** (adapted from CIEEM, 2018).

Feature	Criteria/Examples Used to Determine Importance
International/European	<ul style="list-style-type: none"> • an internationally important site e.g. SAC, Biosphere Reserve (or a site proposed for, or considered worthy of such designation); • a regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive), i.e. European Protected Species; • areas of internationally important habitats which are degraded but are considered readily restored; and • A regularly occurring population of an internationally important species, which is threatened or rare in the UK, i.e. an International Union for Conservation of Nature (IUCN) Red List species⁸.

⁷ CIEEM's Competency for Species Survey Framework: <https://cieem.net/resource/competencies-for-species-survey-css/>

⁸ The official Red List for British Mammals produced by the Mammal Society was released in July 2020: <https://www.mammal.org.uk/science-research/red-list/>. Under the IUCN Red List criteria, each species is allocated to one of the following categories, relating to imminent risk of

extinction: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD) and Not Assessed (NA).

Feature	Criteria/Examples Used to Determine Importance
National (Scotland)	<ul style="list-style-type: none"> a nationally designated site e.g. SSSI, or a site proposed for, or considered worthy of such designation. a viable area of a habitat type listed in Annex 1 of the Habitats Directive or smaller areas of such habitat which are essential to maintain the viability of a larger whole; a regularly occurring substantial population of a nationally important species, e.g. listed on Schedules 5 & 8 of the Wildlife and Countryside Act (as amended); areas of nationally important habitats which are degraded but are considered readily restored; a feature identified as a priority species/habitat in the SBL; a regularly occurring, locally significant population of a species listed as being nationally scarce (e.g. species recorded from 16-100 10x10km squares of the national grid); and any regularly occurring nationally significant population of a nationally important species which is threatened or rare in the UK.
Regional (South Ayrshire)	<ul style="list-style-type: none"> viable areas of priority habitat identified in the ALBAP or smaller areas of such habitat which are essential to maintain the viability of a larger habitat as a whole; a local statutory designated site e.g. LNR; a site designated as a non-statutory designated site e.g. LWS, Scottish Wildlife Trust (SWT) Reserve, or an 'irreplaceable'⁹ woodland site listed on the Ancient Woodland Inventory (AWI); areas of internationally or nationally important habitats which are degraded but are considered restored with substantial management; any other non-statutory sites of importance for specific habitat, species or assemblage; and a sustainable population of a nationally scarce species (e.g. species recorded from 16-100 10x10km squares of the national grid) including species listed on the SBL and ALBAP.
Local (the Site and its vicinity, including areas of habitats contiguous with or linked to those within the Site)	<ul style="list-style-type: none"> areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration; a good example of a common or widespread habitat in the local area, e.g. those listed as broad habitats on the ALBAP; and species of international or national importance, but which are only present very infrequently or in very low numbers within the subject area.
Site (Proposed Development Area and relevant EZols)	<ul style="list-style-type: none"> areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest; and common and widespread species.

Table 7.2 Importance Criteria for Ecological Features

⁹ Irreplaceable habitats are habitats which would be technically very difficult (or take a very significant time) to restore, recreate or replace once destroyed, taking into account their age, uniqueness, species diversity or rarity. They include ancient woodland, ancient and veteran trees, blanket bog, limestone pavement, sand dunes, salt marsh and lowland fen.

- In cases where the importance of an ecological feature varies and as such could be assigned to different geographical contexts, such as where a habitat is primarily a poor example but also contains areas of higher quality habitat, the phrase 'up to' has been applied.
- For the purposes of this assessment, ecological features of:
 - 'Local' importance or higher are assessed as being IEFs and are considered further within the assessment; and
 - 'Site' importance are not assessed as being IEFs and are not carried through to the impact assessment.
- In addition to the assessment of IEF, the impact assessment also considers legal protection of habitats and species, where relevant to the Proposed Development, whether they are an IEF or not.

7.4.5 Characterising Ecological Impacts and Effects

- The following definitions are used for the terms 'impact' and 'effect' (with reference to CIEEM, 2018):
 - impact – actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a woodland; and
 - effect – outcome to an ecological feature from an impact. For example, the effects on a red squirrel population from loss of a woodland.
- Characterisation of impacts and assessment of the significance of resulting ecological effects takes into account the following (with reference to CIEEM, 2018):
 - whether the impact has a beneficial or adverse effect in terms of nature conservation objectives and policy;
 - the size, importance and sensitivity of the feature;
 - the duration, magnitude and extent of the impacts;
 - the timing and frequency of the impacts (e.g. whether the impacts occur at critical life stages); and
 - the ability of the affected feature to recover from temporary impacts and likely timescale of recovery (i.e. reversibility).
- For the purposes of the impact assessment, the magnitude of predicted impacts on a feature are categorised as high, medium, low or negligible as defined in **Table 7.3** and impact duration will be defined for IEFs in relation to ecological characteristics (such as the lifespan of a species) as well as human timeframes.

Level of Impact	Description
High	Major impact on the nature conservation status of the Site, habitats or species, likely to threaten the long-term integrity of the system.
Medium	Moderate impact on the nature conservation status of the Site, habitats or species, but would not threaten the long-term integrity of the system.
Low	Noticeable, but either of sufficiently small scale or short duration to cause no harm to the conservation status of the Site, habitats or species.
Negligible	Not expected to affect the conservation status of the Site, habitats or species under consideration in any way, therefore no noticeable effects on the ecological feature.

Table 7.3 Impact Magnitude

7.4.6 Ecologically Significant Effects

- In line with good practice guidance (CIEEM, 2018), effects are either defined as '**significant**' or '**not significant**'. A significant effect is described as "*an effect that either supports or undermines biodiversity conservation objectives*

for” the relevant ecological feature or its integrity or conservation status¹⁰. Whether effects are deemed to be significant or not is dependent on the extent to which the predicted impacts have the potential to cause a change in the condition or status of the feature under consideration.

31. For designated sites, this typically involves whether the impacts will result in a change, positive or negative, in the structure and functioning of that site in relation to the reasons for which it was designated (i.e. its qualifying habitats and/or species). This may involve consideration of changes in the condition, extent, or functionality of qualifying habitats or the size and viability of the population of qualifying species. This may involve consideration of impacts which are predicted to take place outside of the boundaries of designated sites, but which may affect habitat which plays an important role in supporting qualifying features of designated sites; so called ‘functionally linked land’.
32. For habitats and species which are not associated with designated sites, determination of significance typically involved consideration of changes in the condition, extent, functionality and distribution of habitats, and the abundance and distribution of species, relative to baseline habitat and species conditions at the appropriate geographic scale.
33. The impact assessment considers the effects of the Proposed Development with the application of embedded mitigation (i.e. measures which are an inherent component of the design and include the application of best practice measures). This gives an indication of the need for additional mitigation to be implemented where significant adverse effects are predicted. The likely effectiveness of that additional mitigation has then been considered, and a residual effect stated.

7.4.7 Limitations to the Assessment

34. Every effort has been made to provide a comprehensive description of the EZol, however, the following specific limitations apply to this assessment:
 - Ecological survey data is typically valid for 12-18 months unless otherwise specified, for example if conditions are likely to change more quickly due to ecological processes or anticipated changes in management (CIEEM, 2019). All surveys undertaken to inform this assessment of impacts on Ecology and Biodiversity have been undertaken within the past 18 months, the majority within the past six months, and are therefore considered to be valid.
 - Records held by local biological record centres and local recording groups are generally collected on a voluntary basis; therefore, the absence of records does not demonstrate the absence of species, it may simply indicate a gap in recording coverage.
 - The data within this chapter and appendices represent an accurate assessment of mobile species’ activity within the relevant Survey Area at the time of the survey but there is potential for the presence and distribution of mobile species’ to change prior to commencement of the Proposed Development.
 - Other limitations to the ecological surveys are detailed in the relevant appendices, however, none of the limitations identified are considered to have reduced the robustness of the surveys or their results.

7.5 Baseline Conditions

7.5.1 Overview

35. In the following sections, the desk study and field survey components (where relevant) for each feature are presented together. It should be noted that only those designated sites located within the relevant EZols in association with the Site are presented here. Therefore, there may be some discrepancies between the data

¹⁰ Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and function as well as the long-term distribution and abundance of its population within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its population within a given geographical area.

presented within this chapter to those described within the appendices due to the progression of the Proposed Development’s design and reduction of the area to be developed.

7.5.2 Designated Sites and Ancient Woodland

36. The desk study identified one statutory designated site within the relevant search areas from the Site; this is Merrick Kells SAC/SSSI. Notwithstanding this, this designation has been scoped-out for further consideration within the assessment as detailed in **Section 7.3.1.1**. It is therefore summarised in **Table 7.4** below for information only. This designation is also detailed further in **Appendix 7.1 Ecology Baseline Report** and shown on **Figure 7.1.4a Statutory Designated Sites**.

Feature	Description
Designated site	
Merrick Kells SAC/SSSI	This designation is located approximately 6.7km from the Site and is designated for acid peat-stained lakes and ponds, acidic scree, blanket bog, clear water lochs with aquatic vegetation and poor to moderate nutrient levels, and its important population of otter.

Table 7.4 Statutory Designated Sites

37. A total of five non-statutory designated sites were recorded within the search area surrounding the Site. These are: Galloway Red Squirrel Priority Woodland (RSPW), GSAB, River Stinchar provisional Local Wildlife Site (pLWS), Straiton Hills pLWS and Craigenreoch and Eldrick Hill pLWS. These designations are detailed further in **Appendix 7.1 Ecology Baseline Report**, shown on **Figure 7.1.4b Non-Statutory Designated Sites and Ancient Woodland** and summarised below in **Table 7.5**.
38. In addition, three woodland parcels included within the AWI were identified within 2km of the Site. These are outlined within **Table 7.5** and are shown on **Figure 7.1.4b Non-Statutory Designated Sites and Ancient Woodland**. Due to the distance of these parcels of woodland from the Site, ancient woodland designation will not be considered further within the assessment.

Feature	Description
Designated sites	
GSAB	The Site is located within the Buffer Zone of the GSAB. “Galloway and Southern Ayrshire Biosphere Reserve is comprised of a major bio-geographic region represented by an upland massif centred on the Merrick and the rivers that flow from this upland down through forests and farmland to the sea. Landscape mosaics in the area comprise uplands, moorlands, mires, woodlands and forests, farmland, river valleys, coast and shoreline. The Biosphere Reserve is working to demonstrate the importance of landscapes and ecosystems for the future of sustainable development in a region which is undergoing change in traditional livelihoods ¹¹ ”. Surface area: 526,888 hectares (ha) Core area(s): 10,658ha Buffer zone(s): 84,523ha Transition area(s): 431,707ha. The biosphere programme ¹² identifies three main functions for the designated areas: conservation; development; and logistical support.
Galloway RSPW	The Site is wholly incorporated within woodland which has historically been recognised as a RSPW, selected as such using the Reynolds and Bentley selection criteria (Reynolds and Bentley, 2004). However, some of these sites have been superseded by Red

¹¹ Taken from: <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/europe-north-america/united-kingdom-of-great-britain-and-northern-ireland/galloway-and-southern-ayrshire-biosphere/> [accessed 25/09/2020].

¹² Taken from: <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/main-characteristics/functions/> [accessed 25/09/2020].

Feature	Description
	Squirrel Strongholds (RSS); a scheme led by Scottish Forestry. Notwithstanding, the Site has not been reassigned onto the RSS scheme ¹³ nor does it appear to be incorporated within a current Priority Area for Red Squirrel Conservation (PARC) (Saving Scotland's Red Squirrels, 2020).
River Stinchar (Milton to Black Hill) pLWS	An area of predominately upland habitats including blanket bog on higher ground. The area, which includes Linfern Loch and its immediate margins, is known to contain scarce plant species and breeding birds and is located on the south west boundary of the Site and extends to within approximately 150m to the south (i.e. outside) of the Proposed Development Area.
Straiton Hills pLWS	An area of botanical and ornithological interest with upland and wetland habitats, moorgrass grassland, blanket bog, rush pasture, several lochs and wooded glens. This area is located approximately 425m north east of the Site.
Craigenreoch and Eldrick Hill pLWS	An area of predominantly upland habitats including blanket bog. The area is known to be an important site for breeding birds and a large range of upland species. This area is located approximately 1.9km south of the Site.
AWI	
Tairlaw Glen	A 13.5ha area of ancient woodland of semi-natural origin located over 400m north east of the Site.
Whiterow Scaurs	A 3.7ha area of 'Roy' woodland ¹⁴ located 1.8km south west of the Site.
Whiterow Burn	A 2.5ha area of ancient woodland of semi-natural origin located 1.9 km south west of the Site.

Table 0.5 Non-statutory Designated Sites and Ancient Woodland

7.5.3 Terrestrial Habitats

39. There were no records of notable flora species from the Botanical Society of Britain and Ireland (BSBI) during the desk study consultation from within the Site. Within 2km of the Site, three records of notable plant species were provided by BSBI which were bluebell *Hyacinthoides non-scripta*, alpine clubmoss *Diphasiastrum alpinum* and corn spurrey *Spergula arvensis*. No notable species were identified within the NVC Survey Area.
40. Baseline data for flora and habitats based on the NVC surveys are described in **Appendix 7.2 Habitats Baseline Report** and vegetation communities are shown on **Figure 7.2.1 NVC Survey Area and Results**. The majority of the NVC Survey Area is dominated by either standing or recently clear-felled coniferous plantation woodland consisting of Sitka spruce. Wayleaves and rides were all modified in some way due to drainage ditches created for the forestry, though communities identified within these areas still tended to be very wet and were predominantly affiliated with blanket bog type habitat. Clearings near Gartleffin Fell, at Linfern Loch and by Clashverains, were recorded as having the most diversity and botanical interest and included dry and wet heath, blanket bog, flush and marshy grassland communities. The majority of the non-forested habitats particularly along the wayleaves and rides, were composed of variable mosaics of bog/mire, wet heath and marshy grassland communities, as demonstrated **Figure 7.2.1 NVC Survey Area and Results**, as opposed to distinct, homogenous vegetation communities. Most of these mosaics could not be clearly distinguished from one another to enable each composite to be assigned a relative proportion. Instead, the composite communities within each mosaic were recorded in order of dominance and are labelled as such in **Figure 7.2.1 NVC Survey Area and Results**.
41. **Table 7.6** lists the various vegetation communities recorded within the NVC Survey Area and categorises them under the broad habitat types within which they most closely fall, in order of predominance. These broad overarching habitat types are also represented in **Figure 7.2.1 NVC Survey Area and Results**. Since the majority of non-forested habitats are represented by mosaics of these communities the assessment of impacts on habitats has focussed on these broad habitat types rather than the more complex and highly variable community mosaics which occur throughout the NVC Survey Area.

¹³ Assessed from the following figure: <https://forestry.gov.scot/publications/21-map-of-red-squirrel-stronghold-areas>

Broad Habitat Type	Associated/Constituent NVC Communities	Extent within NVC Survey Area (ha)	% of NVC Survey Area
Coniferous Plantation Woodland	• Non-NVC – Coniferous plantation woodland	573.66	82.48
Blanket Bog Mosaic (most often occurring as M18/M19/M23/M25 mosaic)	• M2 <i>Sphagnum cuspidatum/fallax</i> bog pool community; • M17 <i>Trichophorum germanicum–Eriophorum vaginatum</i> blanket mire; • M18 <i>Erica tetralix–Sphagnum papillosum</i> raised and blanket mire; • M19 <i>Calluna vulgaris- Eriophorum vaginatum</i> blanket mire; • M23/M23a <i>Juncus effusus/acutiflorus–Galium palustre</i> rush-pasture, <i>Juncus effusus</i> sub-community; • M25/M25a <i>Molinia caerulea-Potentilla erecta</i> mire; and • Mx Non-conforming mire communities.	91.75	13.19
Dry Heath	• H1 <i>Calluna vulgaris –Festuca ovina</i> heath; • H10 <i>Calluna vulgaris – Erica cinerea</i> heath; • H12 <i>Calluna vulgaris- Vaccinium myrtillus</i> heath; and • Hx Non-conforming heath communities.	12.87	1.85
Hardstandings/Bareground	• Non-NVC – Hardstandings/ Bareground (Access Roads and Quarries).	5.91	0.85
Acid Grassland	• U4 <i>Festuca ovina–Agrostis capillaris–Galium saxatile</i> grassland; and • U6 <i>Juncus squarrosus-Festuca ovina</i> grassland.	4.27	0.61
Wet Heath Mosaic	• M15 <i>Trichophorum germanicum–Erica tetralix</i> wet heath; • M23/M23a <i>Juncus effusus/acutiflorus–Galium palustre</i> rush-pasture, <i>Juncus effusus</i> sub-community; and • M25 /M25a <i>Molinia caerulea-Potentilla erecta</i> mire.	3.65	0.53
Marshy Grassland	• M23/M23a <i>Juncus effusus/acutiflorus–Galium palustre</i> rush-pasture, <i>Juncus effusus</i> sub-community.	2.04	0.3
Acid/Neutral Flush	• M6 <i>Carex echinata-Sphagnum recurvum/auriculatum</i> mire	0.84	0.12
Semi-improved Neutral Grassland	• MG6 <i>Lolium perenne-Cynosurus cristatus</i> grassland MG10a <i>Holcus lanatus-Juncus effusus</i> rush pasture, typical sub-community; and • MGx Non-conforming grassland communities.	0.53	0.08

Table 7.6 Terrestrial Habitats

¹⁴ Definitions of those habitat included within the AWI can be found in the NatureScot guidance note 'A guide to understanding the Scottish Ancient Woodland Inventory (AWI)': <https://www.nature.scot/sites/default/files/2018-11/A%20guide%20to%20understanding%20the%20Scottish%20Ancient%20Woodland%20Inventory%20%28AWI%29.pdf>

42. Calculations to determine the potential effect of the Proposed Development's construction on the habitats present within the Proposed Development Area have also been completed and are presented in **Table 7.7**. These calculations considered:

- Permanent/direct loss - the actual footprint of the Proposed Development.
- Permanent/indirect change – this is defined as where the footprint of the development passes through hydrologically dependent, typically peat-based, habitats upon which it is likely to have a direct impact, where indirect impacts may be extended to the immediately adjacent, associated vegetation communities. This would be through drawdown of the water table associated with the surrounding habitats and vegetation and would likely cause a permanent alteration in the floral communities able to tolerate the altered environmental conditions. The area of predicted impact is assessed as within 10m of the development's footprint.

Broad Dominant Habitat	Area of Permanent/ Direct Loss (ha)	Area of Permanent/ Indirect Change (ha)	Aggregate Area of Impact (ha)
Coniferous Plantation Woodland	22.73	N/A	22.73
Blanket Bog Mosaic	2.54	6.82	9.36
Dry Heath	1.12	N/A	1.12
Semi-improved Neutral Grassland	0.33	N/A	0.33
Acid Grassland	0.00	N/A	0.00
Wet Heath Mosaic	0.00	0.00	0.00
Marshy Grassland	0.00	0.00	0.00
Acid/Neutral Flush	0.00	0.00	0.00
Hardstandings/Bareground	N/A	N/A	N/A

Table 7.7 Summary of Predicted Habitat Losses Associated with the Proposed Development

43. In addition to the above habitat loss figures associated with the footprint of the Proposed Development, **Chapter 13: Forestry** states that there would be approximately 223.48ha of advanced felling of which 96.68ha would not be replaced (i.e. lost from the Site, including the 22.73ha lost through the Proposed Development footprint above). Approximately 24.33ha of this lost coniferous plantation woodland will be removed as part of the proposed habitat management prescriptions designed to offset bog habitat losses (see **Appendix 7.6 Outline Habitat Management Plan (OHMP)** and **Chapter 13: Forestry**). Summary details of the OHMP proposals are presented in **Section 7.7**.

7.5.4 Aquatic Habitats

44. The Site sits within the catchment areas for the Water of Girvan to the north and north east and the River Stinchar to the south and south west. A large number of watercourses that drain the northern, north western and south western parts of the Site were small upland headwaters that had limited salmonid (salmon and trout) habitat. The upper extents of these headwaters were marshy and flowed through coniferous plantation and forest rides. The small upland headwaters that were present were fed mainly by forestry drains and are typically characterised by overgrown bankside vegetation, poor connectivity and poor substrate heterogeneity, being mostly comprised of peat. Suitable substrate and flow types for juvenile salmonids in these smaller headwaters were identified in localised areas downstream towards the edges of the Site. However, the continuity of available habitat, as well as accessibility for fish, was restricted. Outwith the Site, this collection of headwaters converged downstream to form larger burns, namely the Palmullan Burn, Knockoner Burn and Dalquhairn Burn.

45. Five watercourses (or their associated tributaries) were identified as having suitability to support salmonids and four watercourses which drain the Site were identified as providing potentially suitable habitat capable of supporting FWPM, further details of which are presented in **Section 7.5.5.2**.

46. Eight ponds were identified within the GCN Survey Area as providing 'Poor' suitability to support GCN, further details of which are presented in **Section 7.5.5.4**.

47. Further details regarding the water features present and information of Site hydrology is further detailed within **Chapter 6: Hydrology, Hydrogeology, Geology and Soils**.

7.5.5 Protected and Notable Fauna

7.5.5.1 Fish

48. ART provided historical data on Atlantic salmon, trout and lamprey located in watercourses within or downstream of the Site. The River Stinchar supports all three species, whereas only salmonid records were obtained from Dalquhairn Burn, Palmullan Burn and Pulreoch Burn.

49. Following completion of the initial Fish Habitat Walkover Surveys and consultation with ART, five watercourses or their associated tributaries were identified as having potential suitability to support populations of salmonids which resulted in electrofishing surveys at seven sample points on watercourses associated with the Proposed Development Area and a single control sample point not connected to the Proposed Development Area. Sample points were located on the Dalquhairn Burn, Palmullan Burn, Knockoner Burn, Pulreoch Burn and Tairlaw Burn (three sample locations). The control sample survey was undertaken on the Balbeg Burn. All sampling points are shown in **Figure 7.5.1 Desk study and Field Survey Locations**.

50. Within the Dalquhairn Burn, there were 'excellent' densities of salmon fry and 'good' densities of salmon parr. Salmon were found to be absent at all other sample points associated with the Proposed Development Area, however 'excellent' densities were noted within the control sample site for salmon fry but 'poor' densities for parr.

51. Brown trout fry were recorded in all sample sites with 'excellent' densities found within Tairlaw Burn Tributary 3. 'Excellent' densities of brown trout fry were also recorded at the control sampling location. The remaining sample sites recorded brown trout fry at 'good' to 'moderate' densities. 'Excellent' densities of brown trout parr were identified at Tairlaw Burn Tributary 2; 'good' densities at the control site and Palmullan Burn; 'moderate' densities were present at Knockoner Burn and Tairlaw Burn Tributary 1; Pulreoch Burn and Dalquhairn Burn both contained 'very poor' densities; and surveys completed at Tairlaw Burn tributary did not record brown trout parr.

52. No other fish species were recorded during the electrofishing surveys.

53. **Appendix 7.5 Aquatic Ecology Baseline Report** describes the baseline conditions with regards to fish in more detail which should be read in conjunction with **Figure 7.5.1 Desk study and Field Survey Locations**.

7.5.5.2 FWPM

54. Seven locations were provided by ART where FWPM had been recorded, all of which were located over 10km downstream of the Site. Further, location-specific details were not provided for confidentiality and species-protection purposes; and given their distance from the Site, it was not considered necessary to present the data in a separate Confidential Appendix.

55. The initial Fish Habitat Walkover Survey identified the Pulreoch Burn and three tributaries of the Tairlaw Burn as containing suitable features to support FWPM. FWPM surveys were subsequently carried out by ART on these watercourses, as well as the Palmullan Burn and Knockoner Burn.

56. No live FWPM or empty FWPM shells were recorded within any of the watercourses surveyed. Furthermore, low densities of salmonids, which are essential to complete the FWPMs lifecycle, were recorded in these watercourses. As such, it is considered unlikely that FWPM are present within the Site or associated FWPM Survey Area. This species will not be therefore considered further within the assessment.

57. **Appendix 7.5 Aquatic Ecology Baseline Report** describes the FWPM baseline in more detail which should be read in conjunction with **Figure 7.5.1 Desk Study and Field Survey Locations**.

7.5.5.3 Amphibians

58. SWSEIC returned two records of common amphibians within the search radius of the Site. Records include adult common frog *Rana temporaria* sightings and frogspawn located at Tairlaw with palmate newts *Lissotriton helveticus* recorded on the Newton Stewart Road and at Loch Skelloch. The closest record was located on the north east boundary of the Site. No common amphibians were recorded during the various ecological walkover surveys, however palmate newts were recorded in ponds during GCN surveys, details of which are presented in **Appendix 7.1 Ecology Baseline Report**. The Site provides a mosaic of habitats with suitability to support amphibians including areas of standing water, riparian habitats and unmanaged surrounding terrestrial habitats.

7.5.5.4 Great Crested Newts

59. FLS provided positive GCN eDNA tests from four ponds in 2015, the closest of which was located over 70m north of the Site (Pond 8 in the GCN surveys), the remaining three were located over 2km from the Site. However, FLS did not conduct presence/absence surveys at any of these ponds. SWSEIC held no records of GCN within 2km of the Site and advised that the only known/confirmed GCN population in South Ayrshire was at Culzean Castle, approximately 15km north west of the Site.
60. Eight ponds were identified within the GCN Survey Area, the locations of these are shown in **Figure 7.1.3 Ecology Survey Areas**. A further five ponds which were identified by FLS and on Ordnance Survey (OS) mapping, were either not found or existed as ephemeral, wet marshy areas, unsuitable for GCN, as opposed to defined ponds. The eight existing ponds were all assessed as being of 'Poor' suitability for supporting GCN. These ponds also underwent eDNA analysis and returned either negative or indeterminate results. The indeterminate results were most likely derived from the peat-stained water associated with the ponds within the GCN Survey Area, which can affect eDNA analysis.
61. No GCN were recorded during the bottle trapping and torch surveys in any of the ponds surveyed and no GCN eggs were recorded throughout the survey period. The species is therefore considered likely to be absent from the GCN Survey Area, despite the historical positive eDNA result provided by FLS. As such, GCN will not be considered further within this assessment.
62. **Appendix 7.1 Ecology Baseline Report** describes the GCN results in more detail.

7.5.5.5 Reptiles

63. FLS returned records of reptiles during the desk study: one adder *Vipera berus* sighting and five common lizard *Zootoca vivipara* sightings at Hillheather Moor. None were located within 2km of the Site.
64. Three records of common lizard were recorded during the various ecological walkover surveys, one of which was located in close proximity to wind turbine 4, and another near to wind turbine 7 (**Figure 7.1.7 Incidental Species Records**). These were recorded throughout the Proposed Development Area along rides. Mosaics of habitats with suitability to support basking and foraging reptiles were recorded throughout the Proposed Development Area (e.g. heath, scrub, and relatively unimproved grasslands). Several dry-stone walls bisecting the landscape and woodland edge habitats offer suitable reptile features for sheltering.

7.5.5.6 Badger

65. FLS provided three records of badger outwith the search area, these were recorded in 2013 and 2014 located over 2km south of the Site. The closest record to the Site was 2.6km south.
66. The Habitat Suitability Assessment found the north western, central and southern parts of the Site to be of moderate suitability for badger with suitable habitat for sett excavation and foraging resources. The rest of the Scoping Developable Area was found to have low suitability with large areas of the Site being wet and flat and unsuitable for sett excavation. No evidence of badger was recorded during the protected species surveys within the Protected Species Survey Area.
67. **Appendix 7.1 Ecology Baseline Report** describes the badger survey results in more detail and should be read in conjunction with **Figure 7.1.5c Badger Habitat Suitability Assessment**.

7.5.5.7 Otter

68. No historical data for otter was received during the desk study exercise.
69. The Habitat Suitability Assessment found Pulreoch Burn, tributaries of Tairlaw Burn and Palmullan Burn and the River Stinchar to have moderate suitability for otter including foraging, resting and commuting habitat. Other smaller burns and forestry ditches were considered to have low suitability.
70. Abundant otter evidence was found along Pulreoch Burn including multiple spraints and a couch under a fallen conifer tree with spraint on a boulder next to it. The couch was approximately 290m from the Proposed Development Area with no potential to be used for breeding. An otter spraint was also recorded on Tairlaw Burn, being the closest record to the Proposed Development Area 46m north of an existing forestry road proposed for upgrade. An otter

spraint was also recorded at Palmullan Burn during the Habitat Suitability Assessment. No other resting sites were recorded during the survey.

71. **Appendix 7.1 Ecology Baseline Report** describes the otter results in more detail and should be read in conjunction with **Figure 7.1.5b Otter Habitat Suitability Assessment** and **Figure 7.1.6 Protected Species Survey Results**.

7.5.5.8 Water Vole

72. No historical data for water vole was received during the desk study exercise.
73. The Habitat Suitability Assessment found the Pulreoch Burn had moderate to high suitability for water vole and sections of Knockoner Burn had moderate suitability with suitable foraging resources, slow flowing water and banks which would support burrowing. Other watercourses within the rest of the Scoping Developable Area were predominately of low or negligible suitability for water vole including forestry ditches lacking cover, foraging resources and suitable banks for burrowing.
74. Abundant water vole evidence was recorded along the Pulreoch Burn and its tributaries, including burrows, feeding signs and latrines. The burrows identified along one of the tributaries were located directly adjacent to an existing forestry access track proposed for upgrading works. Evidence of water vole was also recorded on unnamed tributaries of Tairlaw Burn and Knockoner Burn.
75. **Appendix 7.1 Ecology Baseline Report** describes the water vole results in more detail and should be read in conjunction with **Figure 7.1.5b Otter Habitat Suitability Assessment** and **Figure 7.1.6 Protected Species Survey Results**.

7.5.5.9 Red Squirrel

76. A total of 13 red squirrel records were received during consultation with SWSEIC. Sightings were located outwith the Site and were predominantly recorded to the north east at Tairlaw Plantation and Tairlaw Ring. The closest record was identified within the Site on the east along Tairlaw Burn.
77. The Habitat Suitability Assessment for red squirrel found the northern and western parts of the Scoping Developable Area to have moderate suitability for red squirrel within the mature woodland. The eastern and southern parts of the Scoping Developable Area were predominately of low suitability for red squirrel based on the habitat present being recently clear-felled woodland and immature Sitka spruce plantation not suitable to provide food or support dreys.
78. Conifer cones chewed by squirrels were recorded at eight locations primarily in areas of mature plantation in the north of the Protected Species Survey Area. No sightings of red or grey squirrels were made during the surveys. Chewed cones cannot be attributed to either species and only indicates presence of squirrels. No dreys were recorded within the Protected Species Survey Area.
79. **Appendix 7.1 Ecology Baseline Report** describes the red squirrel results in more detail and should be read in conjunction with **Figure 7.1.5e Red Squirrel Habitat Suitability Assessment** and **Figure 7.1.6 Protected Species Survey Results**.

7.5.5.10 Pine Marten

80. A total of three records were provided by SWSEIC and FLS during consultation. Records comprised sightings and usage of den boxes within the Site around South Balloch, River Stinchar and Knockbuckle and outwith the Site along the Newton Stewart Road. The closest record received was located on the south boundary of the Site on the River Stinchar (**Figure 7.1.2 Desk Study Records**).
81. The Habitat Suitability Assessment for pine marten found moderate to high habitat suitability across large areas of the Scoping Developable Area. The highest areas of suitability were around Garleffin Fell, with moderate suitability around Stob Hill and River Stinchar. The rest of the Scoping Developable Area was found to be of low or negligible suitability with immature plantation woodland or recently felled forestry.
82. Abundant pine marten and potential pine marten scats were recorded in the western and central parts of the Protected Species Survey Area within mature Sitka spruce plantation woodland. Two adult pine martens were

observed during the Habitat Suitability Assessment, in the north western part of the Protected Species Survey Area and one potential den was located at Stob Hill near the centre of the Protected Species Survey Area during the pine marten survey. Within the north and north west of the Protected Species Survey Area, large areas of fallen trees were not accessible due to health and safety constraints. However, the presence of pine marten scat surrounding these fallen trees may indicate the presence of a den amongst the fallen trees. No aerial dens or potential aerial den features (e.g. cavities or rot holes) were recorded within the Protected Species Survey Area.

83. **Appendix 7.1 Ecology Baseline Report** describes the pine marten results in more detail and should be read in conjunction with **Figure 7.1.5d Badger Habitat Suitability Assessment** and **Figure 7.1.6 Protected Species Survey Results**.

7.5.5.11 Brown hare

84. Five brown hare records were returned by SWSEIC, all of which were sightings located over 2km from the Site to the south west around South Balloch, Larg Hill and Pinvalley.
85. A single incidental sighting of brown hare was made within the western part of the Proposed Development Area on the existing forestry road during the protected species surveys (**Figure 7.1.7 Incidental Species Records**). The Site provides a mosaic of habitats with suitability to support brown hare including areas along access routes, wayleaves and areas of clear-fell.

7.5.5.12 Mountain Hare

86. All records of mountain hare were located north east of the Site boundary on the Newton Stewart Road (C46W), the closest of which was approximately 1.4km south east of the Site (**Figure 7.1.2 Desk Study Records**).
87. No mountain hare sightings were recorded during any surveys or walkovers, however the Site may provide small pockets of suitable habitat, particularly where heathland and moorland habitat is prominent. As the Site is dominated by plantation woodland, the suitability to support mountain hare may be limited and populations of this species are more likely to be supported by habitats in the wider area to the south west and north.

7.5.5.13 European Hedgehog

88. A single record of European hedgehog was returned by SWSEIC, however this was outwith the search area at South Balloch, approximately 2.9km south of the Site .
89. No hedgehogs were recorded during any surveys or walkovers, however this species would utilise a wide variety of habitats and as the Site comprises a mosaic of habitat types which would support this species (e.g. grassland, heathland and moorland, and woodland), it is likely that this species would have a presence.

7.5.5.14 Deer

90. Field signs confirming the presence of deer were noted throughout the Site in the form of incidental sightings. Although no specific deer surveys were undertaken, FLS's Wildlife Manager has provided estimated population numbers which were assessed as being moderate density for the area (between 7 and 20 deer per 100ha [FCS, 2014]).

7.5.5.15 Bats

91. A total of 33 bat records of six separate species (soprano pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus pipistrellus*, Daubenton's bat *Myotis daubentonii*, whiskered *Myotis mystacinus* /brandts *Myotis brandtii*¹⁵, Leisler's bat *Nyctalus leisleri* and noctule bat *Nyctalus noctula*) were provided by SWSEIC and FLS. No records were located within the Site, the closest record is of a soprano pipistrelle approximately 1km east of the northern access entrance (**Figure 7.1.2 Desk Study Records**).
92. No built structures or trees containing suitable PRFs were present within the Bat Potential Roost Feature (PRF) Survey Area. The closest properties include a derelict cottage at Garleffin (NX 34772 99975), approximately 900m north of wind turbine 2 and occupied farm buildings at Glenalla (NS 34685 00168), approximately 1km north-west of wind turbine 2 (see **Appendix 7.3 Bat Survey Report**). Due to the predominant habitat type being coniferous plantation, the Site is considered suboptimal for roosting bats and is unlikely to develop PRFs overtime prior to felling activities occurring. Notwithstanding, the bat activity surveys suggest a *Myotis* roost and soprano pipistrelle

roost is likely to be located in close proximity to wind turbines 2, 5 and 8 due to bat activity being recorded during standard roost emergence times (Russ, 2012). However, as no PRFs were located within the Bat PRF Survey Area, which is the standard buffer used to assess the impacts of windfarms on roosts (SNH, 2019a), it is unlikely that roosting bats are present within the immediate vicinity of the Proposed Development Area and therefore are not considered further within this assessment.

93. Five bat species were recorded within the Site during the activity surveys; soprano pipistrelle, common pipistrelle, *Myotis* species, brown long-eared bat *Plecotus auritus* and Leisler's bat *Nyctalus leisleri* (see **Appendix 7.3 Bat Survey Report**).
94. During the autumn sample period (2019), soprano pipistrelle activity accounted for 76.3% of 1,132 total bat passes of the calls recorded. The soprano pipistrelle echolocation calls were frequently recorded together with type D social calls (Middleton, 2014) representative of advertisement or agonistic calls. Together with calls overlapping with standard roost emergence times (Russ, 2012) at detector 29 located 190 m from wind turbine 2 may suggest a breeding roost is within close proximity. When these data are looked at in terms of activity levels, soprano pipistrelle also have the highest number of nights of high and moderate/high activity levels as summarised below in **Table 7.8**.

Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
<i>Myotis</i>	1	8	5	14	3
<i>Nyctalus leisleri</i>	0	0	0	0	2
<i>Pipistrellus sp.</i>	1	4	1	6	2
<i>Pipistrellus pipistrellus</i>	1	8	3	8	6
<i>Pipistrellus pygmaeus</i>	21	15	2	2	1
<i>Plecotus auritus</i>	0	0	0	0	7

Table 7.8 Number of nights in autumn recorded bat activity fell into each activity band for each species, for all detectors combined (summarised Ecobat data)

95. Overall, activity levels were highest at detector 29 located at wind turbine 2, with high levels of soprano pipistrelle activity being recorded over ten nights.
96. During the spring sample period, soprano pipistrelle accounted for 54.2% (of 664 total bat passes) of passes recorded and when these data are considered in term of activity levels, soprano pipistrelle also have the highest number of nights of high and moderate/high activity levels as summarised in **Table 7.9**. Within the Proposed Development Area, detector 34 located at wind turbine 3 recorded the highest activity over the spring sample period. When activity levels are compared to standard roost emergence times (Russ, 2012), bat activity does not appear to be related to the presence of nearby roosts.

¹⁵ Record was heard on bat detector where it is not possible to differential between these two bat species.

Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
<i>Myotis</i>	0	6	9	8	25
<i>Pipistrellus pipistrellus</i>	1	0	0	9	15
<i>Pipistrellus pygmaeus</i>	21	36	2	8	15
<i>Plecotus auritus</i>	0	0	1	2	8

Table 7.9 Number of nights in spring recorded bat activity fell into each activity band for each species, for all detectors combined (summarised Ecobat data)

97. Data collected during the summer sample period accounted for 61% of a total 2,157 bat passes recorded. Within the Proposed Development Area, detector 34 located at wind turbine 3 recorded the highest number of bat passes. When data was assessed against standard roost emergence times (Russ, 2012), the results suggested detector 26 located near wind turbine 8 may have a soprano bat roost within close proximity. Overall, in terms of levels of activity, soprano pipistrelle had the highest number of nights and moderate/high levels as summarised in **Table 7.10** below.

Species/Species Group	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
<i>Myotis</i>	0	0	7	0	47
<i>Nyctalus leisleri</i>	0	1	8	0	18
<i>Pipistrellus sp.</i>	13	17	29	0	24
<i>Pipistrellus pipistrellus</i>	4	15	45	0	85
<i>Pipistrellus pygmaeus</i>	34	47	81	0	75
<i>Plecotus auritus</i>	0	0	0	0	2

Table 7.10 Number of nights in summer recorded bat activity fell into each activity band for each species, for all detectors combined (summarised Ecobat data).

98. Appendix 7.3 Bat Survey Report and Figures 7.3.1 to 7.3.5 describe the bat data in more detail.

7.5.5.16 Terrestrial Invertebrates

99. Invertebrate records received during the desk study included small pearl-bordered fritillary *Boloria selene* and small heath butterfly *Coenonympha pamphilus* within 2 km of the Site.
100. Notable invertebrate species recorded incidentally during the various ecological surveys included small pearl-bordered fritillary, Scotch Argus *Erebia aethiops*, golden-ringed dragonfly *Cordulegaster boltonii* and ringlet butterflies *Aphantopus hyperantus*. Suitable habitat for invertebrates within the Site is limited to the small and

fragmented areas bog, heath and grassland habitats. The coniferous plantation which dominates the Site is of limited value for terrestrial invertebrates.

7.5.6 Evaluation of IEFs

101. With reference to the criteria and examples shown in **Table 7.2**, the conservation value of each IEF is summarised in **Table 7.11**, together with a justification for the assigned value. Only those IEFs assessed as having a conservation value of Local importance or above will be discussed further in the Assessment of Potential Effects section (**Section 7.6**).

IEF	Justification	Importance
Designated Sites and Ancient Woodland		
GSAB	A designation awarded by the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) in recognition of landscapes, wildlife, cultural heritage and learning opportunities which south west Scotland offers communities, businesses and visitors.	Regional
Galloway RSPW	This scheme has now been superseded in terms of strategic priorities by the RSS and Galloway RSPW does not appear to have been reassigned onto the RSS scheme nor does it appear to be incorporated within a current Priority Area for Red Squirrel Conservation (PARC) (Saving Scotland's Red Squirrels, 2020). However, due to the presence of recent records obtained through consultation with SWEIC (SWEIC, 2020) within the surrounding connective habitats, together with the presence of foraging signs located within the Site, it is likely that the Site provides a local resource to squirrel populations by providing foraging and sheltering opportunities within the mature areas of coniferous plantation.	Local
pLWS.	Designated by South Ayrshire Council these sites are provisionally recognised for local biodiversity importance outside of statutory designated areas.	Local
Terrestrial Habitats		
Blanket Bog	The majority of bog-type habitats are listed on Annex I of the EU Habitats Directive and are also represented on the SBL. Vegetation communities conforming to the blanket bog mosaic represents 13.29% of the NVC Survey Area, 9.36ha of which is predicted to be affected by the Proposed Development. Despite the broad habitat's European conservation status, within the NVC Survey Area it is highly modified (drained) and fragmented by the afforested land use and exists predominantly along wayleaves and rides interspersed blocks of coniferous plantation woodland. Therefore, it considered to be of no more than local conservation value.	Local
Acid/Neutral Flush	Acid/neutral flush habitat is represented on the SBL under Fens. However, the habitat represents 0.12% of the NVC Survey Area and is therefore considered to be of no more than Site conservation value. It is also worth noting that the only area of acid/neutral flush habitat is located outwith the Proposed Development Area.	Site
Dry Heath	Dry heath habitats are listed on Annex I of the EU Habitats Directive and are also represented on the SBL. However, vegetation communities conforming to dry heath habitat represent only 1.91% of the NVC Survey Area and is therefore considered to be of no more than Local conservation value.	Local
Acid Grassland	Acid grassland habitat is represented on the SBL. However, vegetation communities conforming to this habitat represent less than 1% of the NVC Survey Area and are therefore considered to be of no more than Site conservation value.	Site
Wet Heath Mosaic	Wet heath habitats are listed on Annex I of the EU Habitats Directive and are also represented on the SBL. However, vegetation communities conforming to this habitat represent less than 1% of the NVC Survey Area and are therefore considered to be of no more than Site conservation value.	Site

IEF	Justification	Importance
Marshy Grassland	Marshy grassland-type habitats are represented on the SBL. However, vegetation communities conforming to this habitat represent less than 1% of the NVC Survey Area and are therefore considered to be of no more than Site conservation value.	Site
Semi-improved Neutral Grassland	Semi-improved neutral grassland can provide foraging resource and shelter for protected and notable fauna (e.g. badger and brown hare) but is of little intrinsic ecological importance. However, it represents less than 1% of the NVC Survey Area is considered to be of no more than Site conservation value.	Site
Conifer plantation	Mature coniferous plantation represents over 80% of the NVC Survey Area and can provide foraging resource and shelter for protected and notable fauna (e.g. pine marten, red squirrel, badger) but is of little intrinsic ecological importance. It is therefore considered to be of no more than Site conservation value.	Site
Hardstandings/ Bare ground	Hardstandings and bare ground represented by the existing forestry access roads and quarries hold limited ecological value and are therefore considered to be of negligible conservation value.	Negligible
Aquatic Habitats		
Standing Water	A priority SBL habitat (Ponds). Ponds located within the Proposed Development Area were generally small, heavily influenced by the surrounding forestry and underlying peat (i.e. acidic with variable water levels). While they were found to support some aquatic plants, invertebrates and common amphibians they were generally considered to be of low conservation value.	Local
Running Water	A priority SBL habitat (Rivers) and a priority ALBAP habitat (Rivers and Streams). Most of the sections of watercourse within the Proposed Development Area were represented by forestry drainage ditches and minor headwater channels of what became larger burns downstream. Within the immediate influence of the Proposed Development, these watercourses were generally considered to be of low conservation value.	Local
Protected and Notable Species		
Atlantic Salmon	Atlantic salmon is protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and are listed as Priority Species under the SBL. 'Excellent' and 'good' densities of Atlantic salmon were recorded within one of the sampled watercourse with downstream connectivity to the Proposed Development Area. Given the species conservation status, it is therefore considered to be of Regional conservation value.	Regional
Brown Trout	Priority Species on the SBL and are legally protected by the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Brown trout were recorded in all sampled watercourses, with 'excellent' and 'good' densities recorded in a number of them. Therefore, this species is considered to be of Regional conservation value.	Regional
Amphibians (excluding GCN)	All amphibians native to Scotland (except GCN) receive limited protection under the Wildlife and Countryside Act 1981 (as amended), but only against trade (i.e. sale, barter, exchange, transport for sale, or advertise for sale or to buy). Common toad is an SBL species; other amphibians (except GCN) are not on the SBL. The Site provides a mosaic of habitats with suitability to support amphibians including areas of standing water, riparian habitats and unmanaged surrounding terrestrial habitats, palmate newt and common frog were recorded during ecological surveys. Common amphibian species are likely to occur regularly within the suitable habitats found throughout the Site. Therefore, common amphibians are considered to be of Local conservation value.	Local
Reptiles	All reptiles native to Scotland are SBL species and receive limited protection under the Wildlife and Countryside Act 1981 (as amended), against intentional	Local

IEF	Justification	Importance
	or reckless killing and injury and trade. Mosaics of habitats with suitability to support basking, foraging reptiles and hibernating reptiles were identified throughout the Site and three common lizard sightings were recorded during ecological surveys. Reptiles considered to be of Local conservation value.	
Bat species	All bat species in the UK are afforded full statutory protection as European protected species listed on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), which transpose into Scottish Law in the European Community's Habitats Directive (92/43/EEC). With reference to those species identified within the Site; Soprano and common pipistrelle bats, brown long-eared bat, Daubenton's and Natterer's bat Red List Status is considered to be least concern. Whiskered, Brandt's and <i>Nyctalus</i> bats are considered data deficient and are known to be present within the Ayrshire area. Bats are considered to be of Regional conservation value.	Regional
Badger	The species' Red List Status in Scotland is least concern; the population, range and habitat are all stable (Mathews <i>et al.</i> , 2018). The species is legally protected through the Protection of Badgers Act 1992 (as amended). No badger activity was recorded within the Proposed Development Area or EZol, however badger activity has historically been recorded within the wider local area and the Site. As such, this species is considered to be of Local conservation value.	Local
Otter	The species' Red List Status in Scotland is vulnerable; the population is increasing, range is increasing, and the habitat is stable (Mathew <i>et al.</i> , 2018). Otter is protected as a European Protected Species under the Habitats Regulations and is an SBL and ALBAP Priority Species. Otter activity was regularly recorded within the relevant Survey Area, however only a single resting site was recorded. As such, otter is considered to be of Local conservation value.	Local
Water vole	This species has a Mammal Society Red List Status in Scotland is near threatened. Water vole receives partial protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Due to the abundant evidence of water vole activity within the Survey area together with this species' inclusion within a ALBAP Species Action Plan (SAP) and SBL, this species is considered to have Regional conservation value.	Regional
Pine marten	This species has a Mammal Society Red List Status in Scotland of least concern. This species receives full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended); and certain methods of killing or taking pine martens are illegal under the Habitats Regulations. Pine marten is also an SBL Priority Species. Carrick Forest provides occupied artificial den boxes and abundant field signs of pine marten activity was recorded throughout the Survey Area. Pine marten is considered to be of Local conservation value.	Local
Red squirrel	Red squirrel has a Mammal Society Red List Status in Scotland of near threatened. Red squirrels and their dreys (resting places) receive full protection under Schedules 5 and 6 of the Wildlife and Countryside Act 1981 (as amended) and they are an SBL and ALBAP Priority Species. No red squirrel dreys were recorded within the Survey Area, however small areas of habitat within the Site and surrounding area may provide suitable foraging habitat for local populations. Red squirrel is considered to be of Local conservation value.	Local
Brown hare	The species' Red List Status in Scotland is not assessed and is an SBL and ALBAP Priority Species. A single record of brown hare was recorded during ecological surveys and the Site is considered to provide suitable habitat for this species. Brown hare is considered to be of Local conservation value.	Local

IEF	Justification	Importance
Mountain hare	The species' Red List Status in Scotland is near threatened. Mountain hare is protected in the closed season under the Wildlife and Countryside Act 1981 (as amended) and is also a species of 'Community Interest' listed on Annex V of the Habitats Directive where Member States must ensure that their exploitation and taking in the wild is compatible with maintaining them in a favourable conservation status. Mountain hare is an SBL and ALBAP Priority Species. No mountain hare were observed during ecological surveys and the Site is considered to have limited suitability to support this species. Therefore, mountain hare is considered to be of Site conservation value.	Site
European hedgehog	This species' Red List Status is vulnerable. Hedgehog are also listed as a Priority Species in the SBL. No hedgehogs were recorded during any surveys or walkover surveys, however the Site provides suitable habitat to support this species. Hedgehog is considered to be of Site conservation value.	Site
Deer	The Red List Status of red deer <i>Cervus elaphus</i> is least concern, the population size of this species is increasing (although has likely plateaued) along with the range (Mathew <i>et al.</i> , 2018). Roe deer has a Red List Status of least concern and the population and range of this species is assessed as stable. Proposed Development would be unlikely to result in a volume of habitat loss or disturbance that would likely cause displacement of deer to surrounding habitats outwith their current range. Therefore, it is unlikely the Proposed Development would increase grazing pressures to designations in the surrounding area. General animal welfare during construction would be secured through standard best practice measures and the Site's general Species Protection Plan (SPP, see Section 7.6.3), ensuring no adverse impacts to deer welfare. Deer are considered to be of Site conservation value.	Site
Terrestrial invertebrates	Of the species recorded in the vicinity of the Site, either through the desk study records or incidental observations, small pearl-bordered fritillary and small heath butterfly are SBL species. However, the limited availability of suitable habitat for these species within the Site and low frequency of records suggests that the Site is of little value for these species. Therefore, terrestrial invertebrates are considered to be of Site conservation value.	Site

Table 7.11 Conservation Value of IEFs

7.5.6.1 Predicted Future Baseline

102. The clearance of forestry plantation and re-stocking throughout the Site and wider area would likely have the greatest influence on the environmental baseline over time. Otherwise, it is predicted that the Site would undergo natural changes such as vegetation growth, die-back and fluctuation in the abundance and distribution of species populations.
103. Climate change is predicted to result in an increased frequency of storm events and associated flooding, whilst there would be a shift towards (average) drier and warmer summers and milder and wetter winters. Climate change may therefore lead to changes in the structure and functioning of habitats within the Study Area, although any such changes are not expected to significantly alter the importance of the ecological features that make up the current baseline.
104. It is therefore predicted that there would be no perceptible change in the baseline conditions between now and the commencement of the Proposed Development.

7.6 Assessment of Potential Effects

7.6.1 Introduction

105. The following sections provide an assessment of the likely effects of the Proposed Development on the IEFs highlighted in **Table 7.11**. This assessment is based on the development design described in **Chapter 4: Development Description** and covers construction, operational and cumulative effects.

7.6.2 Design Layout Considerations

106. Detailed constraints advice was provided during the iterative layout design process for the wind turbines and associated infrastructure features (discussed further in **Chapter 3: Site Selection and Design**). Throughout the design process, the desk study and field survey results were fed back to the design team to inform development of the design as part of an iterative design process. This approach identified site constraints in order to minimise a number of potential effects and the following ecological features were considered:

- protected species and habitat survey results were considered in order to identify broad areas of constraint;
- Where practicable, the layout of the Proposed Development has been designed to avoid areas of deeper peat (>1.5m) and by extension the associated bog-type habitats, such that the Proposed Development Area predominantly intersects with shallower areas of peat as well as more degraded and modified areas of bog habitat;
- potential GWDTEs were avoided as far as possible during the Proposed Development design. As the design evolved, these areas were further investigated to establish whether they were confirmed GWDTEs. Where GWDTEs were confirmed, these areas were avoided;
- the recommended minimum 50m habitat standoff distances from blade swept path to key habitat features have been incorporated into the design to reduce collision risk to bats (see **Appendix 13.1: Forestry (Section 5.1)**);
- a 50m buffer zone has been applied around all watercourses which traverse the Proposed Development Area. These buffers were used to ensure that wind turbines and infrastructure, other than access roads, were not located in close proximity to hydrological features. This reduces the risk of run off and water pollution into existing watercourses;
- watercourse and ditch crossings have been avoided in the design of the access track layout as far as possible. Where access necessitates watercourse crossings, construction features have been limited and utilised existing watercourse crossings as far as possible. There would be seven watercourse crossings identified from the final design layout, where Controlled Activities Regulations apply (see **Chapter 6: Hydrology, Hydrogeology, Geology and Soils**);
- where watercourses are crossed, clear-span bridges are the preferred solution to minimise ecological effects and allow safe passage of otters, fish, water voles. Where culverts are required, they have been designed to be as short as possible and allow as much light penetration as possible at the culvert inlets and outlets to encourage use by fish and otters;
- all crossings of watercourses which have been confirmed to support fish (or potentially support fish) would be designed to ensure the free movement of fish past them. Where provision is required for fish, the priority is that natural channel substrate is retained, which may be accomplished using depressed invert culverts; and
- operational lighting would be limited to aircraft warning lights and lighting within the Substation Compound, thus minimising light-related impacts on nocturnal or crepuscular species such as bats, badgers and otters.

7.6.3 Mitigation by Design, Embedded Mitigation and Project Assumptions

107. This assessment takes into consideration the design layout evolution (**Section 7.6.2**) and has been completed assuming delivery of embedded mitigation measures entrenched in the Proposed Development's design in the Project Assumptions outlined in **Section 7.6.3.1** below.

108. In conducting the assessment, the following assumptions have been made:

- Construction Environmental Management Plan (CEMP): A CEMP would be produced and implemented by the Principal Contractor building upon the outline principles set out in **Appendix 4.2 Outline CEMP**. The CEMP

and associated documents would be subject to written approval from NatureScot, South Ayrshire Council and SEPA;

- **Environmental Clerk of Works (ECoW):** A suitably qualified experienced Environmental Clerk of Works would be appointed by the Principal Contractor prior to and for the duration of the construction period. Tool Box Talks would be delivered to all construction staff by the Principal Contractor's ECoW. The ECoW would be qualified and experienced with regard to environmental and ecological construction issues and ideally be an AECOW¹⁶ member (or equivalent).;
- **General Construction Measures:** Temporary construction compounds and on-site working areas would be sited away from sensitive habitats, running and standing water (particularly those watercourses confirmed or with the potential to support salmonids, i.e. the River Stinchar, Pulreoch Burn, Tairlaw Burn, Knockoner Burn and Pulmullan Burn); to minimise the risk of polluted run-off/wastewater or chemicals entering these habitats and dust deposition. Appropriate signage would be used to clearly identify these areas to avoid accidental encroachment. Construction methods would follow relevant best environmental practice to eliminate or reduce the potential for adverse effects on the water environment through a Pollution Prevention Plan (PPP). The PPP would also include details of incident response plans, mitigation and emergency responses to spillages, failure of temporary works, bank collapse, vandalism, extreme weather events etc. If a construction related incident occurs which could significantly affect the onsite watercourses, construction should stop until the problem is identified and isolated. SEPA and ART should be informed and appropriate mitigation measures implemented to ensure no further impacts can occur. The aim of remedial actions should be to restore baseline conditions as quickly as possible. Construction would comply with the best practice construction methods outlined by SEPA in 'Engineering in the Water Environment Good Practice Guide: temporary construction methods' (SEPA, 2009) and in CIRIA, 2015. The PPP would include water protection measures specified in **Chapter 6: Hydrology, Hydrogeology, Geology and Soils**. These include implementation of pollution prevention measures, dust control, and buffer zones around sensitive features; use of check dams, silt fencing etc;
- **Working hours:** These would be agreed by the appointed Principal Contractor, the Applicant and South Ayrshire Council prior to works commencing. However, standard construction working hours are assumed to be Monday to Friday 07:00 to 19:00 and Saturdays 07:00 to 13:00; reducing the level of disturbance to nocturnal and crepuscular species, such as badgers, bats and otters. Any specific temporal working restrictions would be localised to particular sensitive features, such as in proximity to resting sites etc., and would be set out in relevant Special Protection Plans (outlined below);
- **Peat and Soil Management:** Procedures to sensitively and effectively manage the excavation, storage, reuse and reinstatement of peat and soils are detailed in **Appendix 6.2: Soil and Peat Management Plan**.
- **Air Quality Management and Dust Deposition:** Measures for the control of air quality and emissions (including dust management measures) would be included within the CEMP and would include protection measures specified in **Appendix 4.2 Outline CEMP**;
- **Noise and Vibration Management:** Measures for the control of noise and vibration would be included within the CEMP to manage noise and vibration impacts on sensitive ecological features. This would include a selection of appropriate quiet plant to reduce noise emissions; noisy plant would be kept as far away as possible from any sensitive features recorded during pre-construction surveys (i.e. water vole burrows, bird nesting areas, brown trout spawning habitat, as directed by the ECoW);
- **Species Protection Plan (SPP):** An SPP would cover the following species/species groups as a minimum: fish, herpetofauna (amphibians and reptiles), bats, badger, otter, water vole, pine marten and red squirrel. Pre-construction surveys would be conducted according to standard guidance. Pre-construction surveys would include densely forested areas (e.g. thicket stage) that were inaccessible in the surveys reported herein, due to close nature of planting; if these are inaccessible for pre-construction survey, an ECoW would directly supervise all felling within these inaccessible areas. The results would be interpreted and used to provide any specific mitigation measures or licensing requirements prescribed within the SPP. Requirements for buffer zones would be identified within the SPP (complying with legal and guidance requirements), enforced onsite by the ECoW

and informed to the workforce via Tool Box Talks and appropriate fencing and signage. Where it is identified that construction works would result in the loss of protected species resting sites (e.g. badger setts, red squirrel dreys, pine marten dens, otter holts, water vole burrows etc.), species would be excluded according to the terms of any derogation licenses. The SPP would also specify measures to be put in place to ensure works would minimise the risk of disturbance, killing, or injuring of species, such as: avoiding working at night where possible to minimise disturbance to nocturnal/crepuscular species; pre-checking of stored materials prior to use; covering and capping excavations or pipes when not in use; providing a means of escape from excavations; direction of site lighting away from sensitive features for protected species such as watercourses; site speed limit of no greater than 15mph;

- **Fish/aquatic ecology section of the SPP:** This would include for timing of construction works within or adjacent (i.e. within 50m) to watercourses confirmed to support salmonids (or potentially support salmonids), i.e. the River Stinchar, Pulreoch Burn, Tairlaw Burn, Knockoner Burn and Pulmullan Burn, to be planned where possible to avoid the sensitive lifecycle stages of the fish present, i.e. to avoid October to May inclusive. The Aquatic Ecology SPP would address sensitivity, including to noise and vibration, of those fish species present (brown trout) and ensure that appropriate construction methods would be implemented to minimise and avoid disturbance or avoidance behaviour during critical life stages. Should any part of a watercourse containing fish need to be impounded during the works, a fish rescue and translocation would be carried out to remove fish from the impoundment. Fish translocation operations require authorisation from MSS, DSFB and the relevant landowner, therefore, such operations would need to be planned well in advance. In order to help maintain baseline fish populations a Fish Monitoring Programme would be prepared and implemented as part of the SPP that compares changes in pre-construction densities detailed in **Appendix 7.5 Aquatic Ecology Baseline Report** with those during construction and post-windfarm construction. These surveys should be undertaken between July and October for at least one year after all construction and restoration has been completed;
- **Herpetofauna section of the SPP:** Reptiles are active during the warmer months and hibernate in winter, often in the sheltered crevices of rubble piles. The greatest potential for injury or killing is during the winter hibernation period when they would be unable to move safely away from construction machinery if resting within dense clumps of vegetation, upturned tree roots, stone walls or construction materials. The herpetofauna section of the SPP would set out measures to reduce potential for injury or killing. For example, the ECoW would check existing piles of spoil (brush, logs or rocks) for resting/hibernating reptiles prior to clearance and any excavations which are left open overnight would be inspected for reptiles prior to in-filling, if dug during the reptiles' active period (generally accepted as being late March until the end of October). Any reptiles found would be removed and placed in suitable reptile habitat away from the Proposed Development;
- **Habitat Management Plan:** Outline habitat management prescriptions aimed at offsetting the permanent direct and indirect loss of approximately 9.36ha of bog habitat resulting from the construction of the Proposed Development have been set out in **Appendix 7.6 Outline Habitat Management Plan**. This identifies an area of approximately 28ha within the Site which is currently dominated by coniferous plantation but which has suitable topographical, hydrological and peat depth conditions for bog habitat restoration, as well as connectivity to existing unafforested bog habitat. The OHMP proposes that the trees will be removed from this area after which it will be managed with the aims of initially restoring the conditions for, and subsequently improving the quality of blanket mire habitat. Further details of the OHMP prescriptions are provided in **Section 7.7**. Prior to construction, a detailed HMP would be prepared, building upon the outline principles set out in the OHMP, detailing areas of habitat creation, management, and monitoring required as part of the Proposed Development, in consultation with NatureScot and other key consultees;
- During and after construction, areas that have been disturbed adjacent to construction areas would be restored or reinstated before the construction ends; and
- **Construction Site Lighting:** must avoid key commuting areas, edge habitat, riparian habitat, lighting must take cognisance of BCT lighting guidelines, directed on areas of work only. This information should be included in the CEMP.

¹⁶ AECOW is the qualifying body for Environmental Clerks of Works (ECoW). AECOW has been developed to raise professional standards amongst those providing ECoW services.

7.6.4 Consideration of Effects Accounting for Embedded Mitigation

109. Taking into consideration the design layout considerations detailed in **Section 7.6.2** together with the embedded mitigation and project assumptions outlined above and the use of professional judgement and best practice guidance, construction and operational effects on the IEFs summarised below are considered to be at a **less than Local scale** and are therefore predicted to be **not significant**.

7.6.4.1 Designated Sites and Ancient Woodlands

110. **GSAB:** The Proposed Development is considered to comply with the sustainable economic and community development aims of this designation. The Site is considered to be heavily influenced by anthropogenic factors relating to forestry, and the 'High Focus Habitats and Species' documented within the Natural Heritage Management Plan (GSAB, 2018) have been considered within this assessment.
111. **Galloway RSPW:** Habitat loss through de-vegetation and removal of areas within Carrick Forest to accommodate the Proposed Development may result in a change of land-use within this former non-statutory designated site. Approximately 96.68ha of coniferous plantation is predicted to be lost through the felling proposals, including direct loss resulting from the Proposed Development and through provision of the habitat management proposals (**Appendix 7.6 Outline Habitat Management Plan**). However only those areas to the north and west of the Site were found to contain woodland of a suitable age to support this species, as such the total loss of optimal red squirrel habitat would be considerably lower.
112. **pLWS:** River Stinchar pLWS is located c.150m downslope from the Proposed Development Area near wind turbine 7 and the associated habitats may be hydrologically linked to the Proposed Development. Through the application of good practice measures defined by SEPA and CIRIA and embedded mitigation measures however, the potential for indirect hydrology-derived construction effects have been mitigated. Straiton Hills pLWS is located c.1.1km up-gradient from the Proposed Development Area and therefore hydrologically derived construction effects are not anticipated. It is not anticipated that any airborne impacts would cause potentially significant effects to either sites, particularly with the implementation of air quality management and dust suppression measures prescribed in **Appendix 4.2 Outline CEMP**.

7.6.4.2 Aquatic Habitats

113. **Standing water:** Linfern Loch is located approximately 250m from the access track between wind turbines 7 and 8, while the closest pond located to the Proposed Development is approximately 280m from wind turbine 8. Therefore, these waterbodies would not be directly affected by the Proposed Development and with the application of standard best practice pollution prevention measures as set out in **Appendix 4.2 Outline CEMP** and **Chapter 6: Hydrology, Hydrogeology, Geology and Soils (Section 6.6)**, the potential for construction effects have been mitigated.
114. **Running water:** Seven watercourses would be crossed by and/or be near to new access roads or forest roads proposed for upgrading works as well as in the vicinity of other proposed infrastructure, including wind turbines, borrow pit search areas and cabling. The Palmullan Burn, Dalqhairn Burn and Tairlaw Burn all provide suitable salmonid habitat, and all watercourse crossings would be in accordance with River crossings & migratory fish: Design guidance (Scottish Executive, 2012) to ensure fish access is preserved, as is also prescribed in **Chapter 6: Hydrology, Hydrogeology, Geology and Soils (Section 6.6)**. A 50m buffer has been applied to safeguard all remaining watercourses from indirect effects arising from the Proposed Development. This includes the River Stinchar which passes within approximately 100m of the substation, temporary construction compound and associated access track. In view of design layout considerations and the application of standard best practice measures as set out in **Appendix 4.2 Outline CEMP** and **Chapter 6: Hydrology, Hydrogeology, Geology and Soils (Section 6.6)**, the potential for construction effects has been mitigated.

7.6.4.3 Protected and Notable Species

115. **Salmonids:** Five watercourses were identified as having potential suitability to support populations of juvenile and adult salmonids within the Proposed Development Area and all seven associated sample locations confirmed that these watercourses contained populations of salmonids, albeit at varying densities. The sensitivity of the watercourses and the presence of the salmonid species they support are acknowledged. However, in light of the Proposed Development's best practice design considerations, such as 50m watercourse buffers and the installation of crossings which will maintain fish passage, together with the implementation of standard best practice environmental protection measures as set out in **Appendix 4.2 Outline CEMP** and **Chapter 6: Hydrology, Hydrogeology, Geology and Soils (Section 6.6)** and fish protection measures outlined for inclusion in the

fish/aquatic ecology section of the SPP in **Section 7.6.3** above, the potential for construction effects on salmonids are considered to be mitigated for. Implementations of these measures will also minimise or even avoid adverse effects on fisheries and ensure the conservation of the local fish populations in accordance with the provisions of Schedule 9 of the Electricity Act 1989.

116. The preparation and implementation of a Fish Monitoring Programme as part of the SPP would allow comparison of pre-, during and post-construction fish densities to be made and any potential correlations with the Proposed Development to be identified.
117. **Amphibians:** The Site provides a mosaic of habitats with suitability to support amphibians including areas of standing water, riparian habitats and unmanaged surrounding terrestrial habitats, palmate newt and common frog were recorded during ecological surveys. Common amphibian species are likely to occur regularly within the suitable habitats found throughout the Site. In view of the avoidance of ponds by the Proposed Development Area and the application of standard best practice measures secured within an SPP, including pre-construction checks of stored materials and excavations, the potential for construction effects has been mitigated.
118. **Reptiles:** Mosaics of habitats with suitability to support basking, foraging reptiles and hibernating reptiles were identified throughout the Proposed Development Area and three common lizard sightings were recorded during ecological surveys. Notwithstanding, in view of the application of standard best practice measures secured within a SPP, including pre-construction checks of stored materials, and hibernacula, the potential for construction effects has been mitigated.
119. **Badger:** No evidence of badger activity and no badger setts were recorded within the Proposed Development Area or Protected Species Survey Area. A study conducted on cortisol (a stress hormone) levels of badgers located within 1km of windfarms in the UK demonstrated that individuals appeared to have 264% higher levels of cortisol than that found in badgers located up to 10km from a windfarm (Agnew *et al*, 2016). As the closest historical record of this species was located over 3km away, and no signs to indicate the Site is located within a clan territory were identified during the surveys, it is unlikely that the Site is regularly utilised by this species. Notwithstanding, badgers can quickly establish new outlier or subsidiary setts therefore there is the possibility of badger setts being constructed within the Site in the future. Due to the application of standard best practice measures secured within an SPP, including pre-construction checks for setts, checking of stored materials prior to use, providing a means of escape from excavations, the potential for construction effects has been mitigated.
120. **Otter:** A single couch was recorded approximately 340m from the Proposed Development Area, on Pulreoch Burn. A number of spraints were also recorded on Pulreoch Burn as well as Tairlaw Burn and its tributaries which are all located towards the east of the Proposed Development Area; this is likely due to the direct connectivity to larger, and more profitable foraging habitats such as Loch Bradan and Water of Girvan. In freshwater habitats such as those located within the Site and Otter Survey Area, otters are largely (but not exclusively) nocturnal and occupy very large home ranges (around 32km for males and 20km for females [SNH, 2013]). As the watercourses where field signs were identified have relatively low populations of fish, it is unlikely that these watercourses form an integral part of a much wider otter territory. The baseline data suggest there a relatively low number of field signs identified within the Otter Survey Area (two spraints), with no field signs identified within Proposed Development Area.
121. Otter is a qualifying feature of Merrick Kells SAC and otter activity was identified primarily within the eastern perimeters of the Otter Survey Area. The closest notable waterbody of the designation is Loch Macaterick, located over 6.7km south east of the Site. Although otters can occupy a large home range, with the exception of approximately 14km of convoluted forestry roads and main roads, there is no direct connectivity between the Proposed Development Area, the wider Survey Area and the SAC, specifically there is no hydrological connection.
122. Since the 1990s, otters have been considered widespread throughout Scotland. The most recently reported national survey results (2011-12) (Findlay *et al*. 2015) recorded otter presence at approximately 80% of sampled sites (which included all 44 SACs designated for otter in Scotland and other random sites across the countryside). This is slightly decreased since the previous national survey in 2003-04 (Strachan, 2007) but could be due to factors affecting detectability such as weather. Design layout considerations (including watercourse buffers and culvert design) ensure no known resting places, foraging or commuting routes would be directly affected. With the adoption of standard best practice measures defined by NatureScot and secured within a SPP, including pre-construction checks for resting places, checking of stored materials prior to use, providing a means of escape from excavations,

the potential for effects on otter have been mitigated. Effects on otter are deemed to be at a Site scale and not significant. Furthermore, no significant effects on otter as a qualifying feature of Merrick Kells SAC are anticipated.

123. **Pine marten:** Within the Protected Species Survey Area, suitable habitat was recorded predominantly to the west of the Proposed Development Area in the vicinity of Garlleffin Fell and Knockoner. Large areas of windblown trees were also located within these areas with an abundance of scats and individuals noted to be present within the perimeters of these areas, therefore the absence of dens could not be determined within these areas. A single potential ground level den was also located near Stob Hill.
124. The geographical range of pine martens has increased in the last 10 years (Croose *et al.* 2013), which infers an increase in population size. The Red List for British Mammals (Mammal Society, 2020) cites the central population estimate as 3,700 individuals in Scotland (95% confident limit range is 1600-8900). Data from Galloway Forest upland spruce plantation habitat reports an average of 0.12 pine marten per km² (Harris and Yalden, 2008). Home range size is stated to be highly variable, dependent upon quality of the habitat, Scottish commercial conifer plantations are estimated to be 3-9km² for males and 2-5km² for females (Cresswell *et al.* 2012).
125. In order to support a self-sustaining population comprising several pine marten home ranges, a woodland must have a diverse and year-round food supply; and sufficient opportunities for elevated denning (Cresswell *et al.* 2012). With this in mind, it is assessed that the Site provides sub-optimal habitat for this species due to the homogeneous nature of coniferous planation. No known den sites would be destroyed, damaged or disturbed during the construction period. Opening up of areas around wind turbines would provide opportunities for grassland and tall herbs to provide habitat for field vole; improving the habitat quality and potentially the prey resource for pine martens in the longer term. Best practice measures would be implemented, this would include pre-construction pine marten surveys which would ensure any additional/new pine marten dens and/or well-used feeding areas are recorded and can be protected (including within areas that were inaccessible during the surveys reported herein). If the pre-construction surveys identify that construction works would result in the loss of pine marten dens, the SPP would provide details for compensatory measures to be adopted (including installation of artificial dens). Temporary impacts arising during construction from site activities may result in the killing or injuring of pine martens that may become trapped in exposed excavations or through direct interactions with plant, although it is expected that measures included in the SPP, including restriction on night-time working times, would reduce or eliminate this risk. The workforce would be alerted to potential pine marten presence via Toolbox talks delivered by the ECoW. With the above in mind, effects on pine marten are considered to be mitigated.
126. **Red squirrel:** The red squirrel Habitat Suitability Assessment showed moderate suitability to the north and west of the Site where mature plantation was present; potential squirrel foraging field signs were recorded (though the species was undefined), however no dreys were recorded. The Red List for British Mammals (Mammal Society, 2020) cites the central population estimate as 239,000 individuals in Scotland (95% confident limit range is 181,000-444,000). Squirrel pox virus and other disease outbreaks are known to cause high mortality and are implicated in local extinctions and ongoing population declines. Population declines within Scottish strongholds in the future are inferred from the continued expansion of grey squirrel population and the lack of progress with combatting disease threats. Robust data on the extent of previous and continuing declines are not available but this could plausibly amount to a 20% decline over 3 generations (Mammal Society, 2020).
127. Data from various Scotland sites reports an average of 0.003-0.8 red squirrels per ha in coniferous areas (Harris and Yalden, 2008). Home range size is stated to be highly variable, dependent upon quality of the habitat, but vary between 2.8 and 6.8ha for deciduous woods, and between 7 and 23ha for coniferous woodland. Therefore, it is possible that the Site represents part of a territory/range.
128. Best practice measures would be implemented, defined by NatureScot (2020). This would include pre-construction red squirrel surveys to ensure any new red squirrel dreys and/or well-used feeding areas are recorded and can be protected (including within areas that were inaccessible during the surveys reported herein, i.e. very dense thicket stage coniferous plantation). If the pre-construction surveys identify that construction works would result in the loss of red squirrel dreys, and there is no alternative approach available, the SPP would provide details for licensing requirements and compensatory measures to be adopted (including installation of artificial dreys). In addition, construction activities may result in the killing or injuring of red squirrels that may become trapped in exposed excavations or through direct interactions with plant. However, it is expected that measures included in the SPP, including the delivery of a Tool Box Talk to alert site personnel to potential red squirrel presence would reduce or eliminate this risk. Habitat loss effects would be mitigated though design considerations and project assumptions

set out in preceding sections and through key-hole design of the Proposed Development, minimising direct habitat loss and severance of commuting routes. As a result, any effects on red squirrel are considered to be mitigated.

129. **Brown hare:** A single incidental sighting of brown hare was made on an existing forestry road within the west of the Proposed Development Area. The Site provides a mosaic of habitats with some suitability to support brown hare. It is most common in grassland habitats and at woodland edges, favouring a mosaic of arable fields, grasses and hedgerows, however the Proposed Development is dominated by coniferous plantation which is not considered optimal for the species. The species is likely to occur in low numbers within the suitable habitats found throughout the Site and are a highly mobile species which enables them to move away from construction activities. Due to the application of standard best practice measures secured within a SPP, including pre-checking of stored materials prior to use, providing a means of escape from excavations, the potential for construction effects has been mitigated.
130. **Myotis and brown long-eared bats:** With regards to foraging and commuting bats, *Myotis* species (found in Scotland) and brown long-eared bat populations were recorded to utilise the Site, however, they are considered to be at a low risk from wind turbine collision (SNH,2019). In addition to being a low risk species, *Myotis* bats and brown long-eared bats represented a small percentage of overall bat activity across the Site (*Myotis* activity ranging between 10.5% to 2.9% over the sample periods and brown long-eared bat 0.6% to 0.1% over the sample periods). With this in mind, impacts to species of *Myotis* (in Scotland) and brown long-eared bats are considered to be negligible.
131. The use of artificial lighting has the potential to impact bats through disturbance, creating barrier effects and reducing foraging capabilities and opportunities. However, through to the implementation of the SPP and standard good practice guideline such as those outlined within Bats and artificial lighting in the UK (BCT, 2018), these effects are considered to be mitigated.
132. Although the Site is considered to contain suitable foraging and commuting habitat for bats, the removal of plantation habitat is unlikely to have an adverse effect on these species of bat due to the creation of new edge habitat through key-holing, albeit this positive effect is unlikely to be significant.

7.6.5 Potential Construction Effects

133. This section provides the assessment of likely construction effects of the Proposed Development on the IEFs where effects are not mitigated through the Proposed Development design or embedded mitigation.

7.6.5.1 Terrestrial Habitats

7.6.5.1.1 Bog Habitat

134. Impact: Where practicable, the layout of the Proposed Development has been designed to avoid areas of deeper peat and by extension the associated bog-type habitats, such that the Proposed Development Area predominantly intersects with shallower areas of peat as well as more degraded and modified areas of bog habitat. The procedures detailed in **Appendix 6.2: Soil and Peat Management Plan** to sensitively and effectively manage peat and soils, such as retention of vegetated turves and appropriate storage, reuse and reinstatement of excavated peat, would mitigate for temporary and reversible construction effects on bog habitats such as disturbance and degradation. Nonetheless, construction of the Proposed Development will still result in the direct loss and permanent change to bog habitats intersected by, and immediately adjacent to the Proposed Development Area.
135. Importance: Bog habitats within the NVC Survey Area and associated with the Proposed Development are predominantly located along wayleaves and rides which are highly modified (drained) and fragmented by the afforested land use and considered to be of a reduced quality. Such bog habitat types are widespread across the surrounding area and within the broader landscape of south west Scotland. The bog habitats associated with the Proposed Development are therefore assessed to be of local importance as stated in **Table 7.11**.
136. Magnitude: Direct loss and/or permanent change to bog habitats during construction of the Proposed Development is predicted to affect 9.36ha of the 91.75ha (c.10.2%) of bog habitats present within the NVC Survey Area.
137. Significance of Effect: Taking into consideration the relatively limited abundance and distribution, and highly modified, degraded condition of bog habitat associated with the Proposed Development, particularly in the context of the wider surrounding area, the direct loss and/or change to bog habitats is assessed to be **adverse, permanent and irreversible** but of **low magnitude**, and hence **not significant**.

7.6.5.1.2 Dry Heath Habitat

138. Impact: The vast majority of the Proposed Development avoids dry heath habitat, such that no extensive areas of this habitat type will be affected. However, the existing forestry track which leads out to wind turbine 4 passes through a narrow strip of dry heath habitat in the wayleaves either side of the track. This track is to be upgraded and in doing so it is expected that a small amount of this dry heath habitat will be lost through widening.
139. Importance: Dry heath habitat within the NVC Survey Area and associated with the Proposed Development is limited to two relatively small areas of open hilltop near wind turbine 4 and to the south of Gartleffin Hill, as well as the wayleaves either side of the access track out to wind turbine 4. In the context of the Proposed Development, dry heath habitat represents 12.87ha of the associated NVC survey Area. However, as this represents just 1.91% NVC Survey Area it is therefore assessed to be of no more than local importance as stated in **Table 7.11**.
140. Magnitude: Direct loss of dry heath habitat through predicted widening of the existing access track out to wind turbine 4 is predicted to affect just 1.12ha of the 12.87ha (c.8.7%) of dry heath habitat present within the NVC Survey Area.
141. Significance of Effect: Taking into consideration the limited extent and area of dry heath habitat associated with the Proposed Development, and the fragmented and relatively segregated nature of that along the wayleaves of the existing track out to wind turbine 4, the impact of direct loss to dry heath habitat is assessed to be **adverse, permanent and irreversible** but of **low magnitude**, and hence **not significant**.

7.6.5.2 Protected and Notable Species

7.6.5.2.1 Water vole

142. Impact: Abundant water vole evidence was recorded along the Pulreoch Burn and its tributaries, Knockoner Burn and unnamed tributaries of the Tairlaw Burn, including burrows, feeding signs and latrines. Burrows identified along one of the tributaries of the Pulreoch Burn were located directly adjacent to an existing forestry access track proposed for upgrading works. Construction activity including vehicle movement, vegetation clearance, and storage of construction materials, could result in injury or mortality of individuals from destruction of burrows, collisions or entrapment in uncovered holes, pipes or machinery.
143. Noise, vibration and light spill associated with construction activities could result in the temporary disturbance or displacement of water vole, leading to avoidance of key riparian habitat. Temporary effects arising during construction include disturbance through site clearance, pile driving, excavation works and widening/construction of new access routes (including the removal of trees along existing access routes). On-site lighting and noise (from explosions used to excavate borrow pits) may also result in the disturbance of water vole sheltering in habitat surrounding the Proposed Development.
144. Loss of burrows and suitable riparian habitat to accommodate the Proposed Development could result in fragmentation and displacement through permanent and/or temporary loss or degradation of supporting habitat. Habitat loss would primarily result from the widening/installation of existing/new access routes within the Proposed Development Area where a small number of burrows would be lost or disturbed through vegetation clearance and construction activities. Changes to site hydrology is not deemed likely to cause habitat loss or degradation due to the Proposed Development design and embedded mitigation as stated in **Section 7.6.4**.
145. Importance: Water vole burrows have been identified immediately adjacent to access roads which cross Pulreoch Burn and Tairlaw Burn, which were assessed to have moderate to high suitability to support this species. As stated in **Table 7.11**, water vole are assessed to be of Regional importance, owing to their affiliation with the SBL and provision of an SAP within the ALBAP. The SAP has a long-term objective to: protect and enhance sites where water vole are present; enhance habitat surrounding these sites; link populations and reduce fragmentation. The ALBAP states that there has been a loss of 93% of known water vole sites between 1989 and 2006 in repeatedly surveyed locations in Ayrshire.
146. Magnitude: It is estimated that a short section of suitable riparian habitat would be temporarily or permanently damaged and/ or destroyed to accommodate the upgrade works to the crossing of a tributary of the Pulreoch Burn,

¹⁷ The length of habitat occupied is dependent on population density with mean territory size measuring 30-150 m for females and 60-300 m for male home ranges at high and low densities, respectively (Strachan & Moorhouse, 2006). Occupied riparian habitat is considered to be 5m from each bank edge.

potentially resulting in the destruction and disturbance of a small number of burrows. As this crossing and associated access track are already in existence, it was not considered appropriate or practical to avoid this constraint by constructing a new crossing point and associated access track diversion. Furthermore, it is not anticipated that the footprint of the upgraded crossing would be significantly larger than that of the existing one and that as such, the water vole population would not be segregated by the works at this location.

147. Significance of Effect: Through the application of NatureScot (SNH,2019b), SEPA and CIRIA good practice guidelines and embedded mitigation, a large proportion of suitable riparian habitat would be safeguarded from potential effects caused by construction activities, for example; the integration of 50m exclusion zones surrounding watercourses during the Proposed Development's design; water crossings have been designed to allow free passage of riparian species and avoid fragmentation and the sensitive placement of lighting to avoid riparian corridors. Notwithstanding, it is recognised that water vole burrows would be destroyed and disturbed during the construction phase, which may also result in direct mortality/injury and displacement if unmitigated.
148. As the average lifespan of this species is less than a year (up to five years in captivity), when considering direct injury or mortality effects on individual water voles, this **significant** impact is assessed to be adverse, permanent and irreversible. However, it is predicted that a small amount of suitable riparian habitat may be lost and taking into consideration the estimated territory sizes for a high density population as a precaution¹⁷, it is predicted that only a small number of individuals would be impacted in this way (if at all). Therefore, the overall significant impact to the affected water vole population is assessed to be **adverse** at a **low magnitude, short-term and reversible**.
149. When considering the permanent and/or temporary loss of water vole habitat, it is unlikely that habitat can be suitably restored within a single water vole generation, therefore this impact would be adverse, permanent and irreversible. However, due to the small area of habitat being lost, the impact on the affected population is considered **not significant**.
150. Water vole are considered to be relatively tolerant to noise and visual disturbance (Dean *et al*, 2016), and the recommended exclusion zone to reduce or remove disturbance effects is considered to be 10m from any burrow entrance. Any disturbance and displacement impacts are predicted to derive from track widening and upgrading works, and construction activities within these localised areas are predicted to be completed within several days. Therefore, construction derived impacts are assessed to be **adverse** at a **low magnitude, short-term and reversible**.
151. The increase of construction traffic is considered to have a **non-significant** effect on this species due to its tolerant nature.

7.6.6 Potential Operational Effects

152. This section provides the assessment of likely effects of the Proposed Development on the IEFs during its operation, where effects are not mitigated through the Proposed Development design or embedded mitigation.

7.6.6.1 Protected and Notable Species

7.6.6.1.1 Bats

153. Impacts: Collision mortality, barotrauma and other injuries caused by operational wind turbines.
154. Landscape changes and population displacement: Areas of plantation woodland would be altered through key-holing in order to accommodate the Proposed Development which has the potential to increase exposure to wind turbines by creating new edge habitat particularly to those Scottish species recognised as having medium to high collision risks due to their flight behaviour (with relevance to the Site: common and soprano pipistrelle and Leisler's bat [SNH, 2019]). Impacts caused through the use of operational and maintenance lighting which include; the displacement of commuting and foraging bats, altering the distribution of insect prey. Barrier and displacement effects caused by the windfarm due to avoidance behaviour from local populations and migratory species.
155. Importance: The population size and range of *Nyctalus* bats is currently unknown within Scotland due to the absence of sufficient data. Notwithstanding, a recent study conducted to survey high risk bat species across

Scotland was undertaken in 2017 which suggests that the minimum population sizes for Leisler’s and noctule bats are ‘in the thousands’ and there is a clear west (Leisler’s bat)/east (noctule) distribution split (SNH, 2017). *Nyctalus* bats in Scotland are considered to be at high risk of collision with wind turbines and also have a high population vulnerability (SNH, 2019a). As south west Scotland is a key area for Leisler’s bat distribution and this species is at high risk of collision with wind turbines and has a high population vulnerability, together with the legal protection afforded to bats in the UK, this species is considered further at a Regional context.

156. Common and soprano pipistrelle bats have a medium population vulnerability but high collision risk with wind turbines. With reference to Mathews *et al.* (2018), both soprano pipistrelle and common pipistrelle have a Red List Status of LC, however insufficient data to assess the range status of both species. JNCC documentation (JNCC, 2013) suggests that the likely minimum estimate of soprano pipistrelle bats in Scotland was in the region of 512,000 individuals (2016 – 2017). Common pipistrelle bats are estimated in the region of 285,000 individuals (2016 – 2017). Due to the high volume of pipistrelle (common and soprano) activity recorded in association with the Proposed Development together with being a high risk bat species and the legal protection afforded to bats in the UK, this species is considered further at a Regional context.
157. Magnitude: **Graphs 7.1 and 7.2** show the number of pipistrelle and *Nyctalus* bat passes respectively per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality (SPR, 2020). From these data, it is predicted that without mitigation, the bat activity within the Proposed Development Area would generate fatality rates classified as per **Table 7.12** below. These predictions were made using data obtained through a comparative assessment undertaken by the Applicant in the same region (south west Scotland). This dataset is used as a reference for new projects by providing a comparison of bat activity within a region in a similar manner to EcoBat, but in addition it can benchmark activity rates for new projects against activity rates of sites with a known rate of bat fatality. See **Appendix 7.4 Bat Mitigation Plan** for further details.

Detector location	Pipistrelle fatality rate	<i>Nyctalus</i> fatality rate
21	Incidental-High	None
22	Incidental-High	None
23	None	None
24	Incidental-High	None
25	None	Incidental-High
26	Incidental-High	None
27	Incidental-High	None
28	None	None
29	Incidental-High	None
30	None	None
31	None	None
32	Incidental-High	None-High
33	None	None
34	Incidental-High	None

Key: High =>2 fatalities/wind turbine/year. Incidental =<2 fatalities/wind turbine/year. None = 0 fatalities/wind turbine/year.

Table 7.12 Predicted bat fatality rates for each detector location in the absence of mitigation.



158.

Graph 7.1: Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality. Error bars are 95% confidence intervals derived using bootstrap methods due to non-normal distribution of the datasets. Key: High =>2 fatalities/wind turbine/year. Incidental =<2 fatalities/wind turbine/year. None = 0 fatalities/wind turbine/year.



Graph 7.2: Number of *Nyctalus* bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality. Error bars are 95% confidence intervals derived using bootstrap methods due to non-normal distribution of the datasets. Key: High =>2 fatalities/wind turbine/year. Incidental =<2 fatalities/wind turbine/year. None = 0 fatalities/wind turbine/year

159. **Significance of Effects:** The predicted bat fatality rate at most locations has the potential to be high for either one or both key bat genus. When considering the effect significance of collision risk, barotrauma and injury, together with the average lifespan of both species (4-5 years), slow reproductive rate (average of one pup per year) and lifespan of the Proposed Development, this effect is assessed to be **adverse** at a **high magnitude, long-term** and **irreversible** if no mitigation is applied.
160. Disturbance and displacement impacts during operational and maintenance activities (i.e. lighting and noise) are considered to be mitigated through embedded mitigation detailed within **Section 7.6.4** such as sensitive timing of works, sensitive placement of lighting and the application of good practice guidelines with regards to bats and lighting (BCT, 2018), therefore **no significant effects** are anticipated.
161. When considering the effects of species displacement, with regards to *Nyctalus* species utilising the Site, it is demonstrated through **Figures 7.3.2 – 7.3.4** that Leisler's bat activity was recorded in greater proportions within those habitats to the north and west of the Proposed Development. This suggests that the key roosting, foraging and commuting habitat for this species may already exist outwith the Site. Although a smaller volume of *Nyctalus* activity was recorded within the Proposed Development Area because bat fatalities are becoming well documented throughout windfarms in Scotland, it is unlikely that Proposed Development would cause significant displacement effects on those bat species identified utilising the Site. Therefore, **no significant effects** are anticipated through displacement.
162. With reference to a study completed to determine the responses of bats to clear-fell harvesting in coniferous plantations (Kirkpatrick *et al*, 2017), it was noted, in summary, that *Nyctalus* activity levels were 23 times higher in areas which had been recently felled and overall bat activity for all species was found to increase greatest in felled areas of woodland less than 5ha. Therefore, this study had concluded that key-holing may increase the risk of collision with wind turbines. With this in mind, changes in landscape through key-holing activities is assessed to be **adverse** at a **high magnitude, long-term** and **irreversible** if no mitigation is applied.

7.7 Mitigation

7.7.1 Construction Phase: Additional Compensation and Mitigation

7.7.1.1 Terrestrial Habitats

7.7.1.1.1 Bog Habitat

163. The outline habitat management prescriptions presented in **Appendix 7.6 Outline Habitat Management Plan** have been designed to offset the permanent direct and indirect loss of approximately 9.36ha of bog habitat which is predicted to result from the construction of the Proposed Development. An area of approximately 28ha has been identified within the Site, as shown in **Figure 7.6.1**, which is currently mostly dominated by coniferous plantation but which has suitable topographical, hydrological and peat depth conditions for bog habitat restoration. The OHMP sets out the rationale and criteria for the selection of OHMP area.
164. As mentioned in **Section 7.6.3**, a detailed HMP would be prepared in consultation with NatureScot and other key consultees building upon the outline principles set out in the OHMP.
165. Through the detailed HMP, it is proposed to remove the trees from within the OHMP area. Thereafter the area will be managed with the aims of initially restoring the conditions for, and subsequently improving the quality of bog habitat. The OHMP identifies the methods which are likely to be required to disrupt water drainage and manage conifer regeneration in order to restore bog habitat conditions within the OHMP area. These include;
- cross tracking and ground-smoothing to flatten forestry ridges and infill drainage furrows by upturning trees stumps and to manage regenerating trees;
 - damming of drainage channels and forestry drainage furrows;
 - hand clearance of regenerating trees; and
 - raking of resulting brush into piles.
166. Confidence in the effectiveness of these measures in restoring bog-type habitat is based upon successful trial projects undertaken by the Applicant on several of their other windfarm sites in Scotland, as detailed in the OHMP.

The OHMP includes a long-term monitoring programme which involves the comparison of habitat condition factors against various objectives designed to determine the success of the bog-restoration and enhancement measures and ultimately the aims of the detailed HMP.

167. Through the implementation of the detailed HMP, it is anticipated that approximately 28ha of bog-type habitat will be successfully restored within the Site. This will offset the 9.36ha of bog-type habitat which is predicted to be permanently lost, either directly or indirectly, through the construction of the Proposed Development ultimately resulting in a net gain of 18.64ha of bog-type habitat. The restoration of bog habitat may in turn be expected to result in additional biodiversity benefits such as the provision of habitat for aquatic and terrestrial invertebrates (e.g. small pearl-bordered fritillary and Scotch Argus butterflies and golden-ringed dragonfly which were recorded during the baseline surveys), common amphibians and ground nesting birds.

7.7.1.2 Protected and Notable Species

7.7.1.2.1 Water vole

168. Due to the predicted impacts of habitat loss, disturbance and potential killing or injury to water voles, the following mitigation measures would be undertaken in addition to those outlined within **Section 7.6.4**:

- pre-construction surveys would be undertaken to ascertain the relative population density of the areas to be impacted by habitat loss and/or degradation and construction related disturbance. These surveys are seasonally restricted and should be undertaken between mid-April and the end of September and within 6 months of the commencement of construction works;
- a SPP plan would be created which would detail: a suitable onsite receptor site preferably linked to the existing, donor population¹⁸ which would be an equal area to that lost plus an additional 50% to account for population expansion; methodology of trapping and translocation methods; sensitive timing of works; demarcation of exclusion zones and future monitoring commitments; and
- a derogation licence to destroy burrows and/or disturb water voles would be applied for and construction works would be overseen by a suitably qualified ECoW.

7.7.2 Operational Phase: Additional Compensation and Mitigation

7.7.2.1 Protected and Notable Species

7.7.2.1.1 Bats

169. Due to the predicted fatality rates of pipistrelle and *Nyctalus* bats, additional mitigation measures would comprise curtailment of the operation of all wind turbines during certain weather conditions. The curtailment would apply between 30 minutes post-sunset and 40 minutes pre-sunrise between 1 April until 31 October each year for the lifetime of the Proposed Development. The curtailment strategy would be complemented by a monitoring programme to determine whether the curtailment was effective or whether the timings could be modified at all. These measures are further detailed in **Appendix 7.4 Bat Mitigation Plan**.

7.7.3 Potential Decommissioning Effects

170. The consent being sought for the Proposed Development is in-perpetuity. However, in the event that the wind turbines need to be decommissioned, prevailing guidance (including prevailing guidance on decommissioning and restoration from NatureScot¹⁹) at that time would be followed. Therefore, the effects arising from the Decommissioning Phase are considered to be the same or less significant than those arising from the construction phase.

7.7.4 Assessment Against Future Baseline

171. The conclusions of the impact assessment remain unchanged when considered against the future predicted baseline.

¹⁸ Receptor sites will be secured at least 9 months in advance of construction activities which are limited to the period 1 March – 15 April.

¹⁹ <https://www.nature.scot/guidance-decommissioning-and-restoration-plans-wind-farms-february-2016>; and <https://www.nature.scot/naturescot-commissioned-report-591-research-and-guidance-restoration-and-decommissioning-onshore> [accessed 7/10/2020]

7.8 Residual Effects

172. The following identifies any residual effects on IEFs once the benefits of the additional prescribed mitigation measures have been taken into account.

7.8.1 Construction Phase: Residual Effects

7.8.1.1 Terrestrial Habitats

7.8.1.1.1 Bog Habitat

173. The provisions of the OHMP are anticipated to offset the loss of bog-type habitat resulting from the construction of the Proposed Development as well provide an additional 18.64ha of bog-type habitat with the expectation that this will likely give rise to other biodiversity benefits for associated species. The habitat and species enhancements targeted through the bog restoration measures of the OHMP are not expected to be realised in the short term, not least because the habitat management measures are not anticipated to be commenced until at least 4 years post-felling (**Appendix 7.6 Outline Habitat Management Plan**). Additionally, it will take time for the habitat conditions to recover from the initial disturbance of felling and the implementation of habitat management measures. However, in the medium to long term, the prescriptions of the OHMP are anticipated to result in an increase in extent of bog-type habitat and the abundance of associated flora and fauna at a local scale.

174. Bog vegetation (i.e. Sphagnum mosses) and bog-forming conditions are not expected to become established until after the first few years following the implementation of habitat management measures (e.g. typically between 3-10 years following management²⁰). Therefore, off-setting the loss of bog-type habitat resulting from the Proposed Development is predicted to be achieved approximately 10-15 years post-felling. Nonetheless, through the provisions of the OHMP the residual effects on bog habitat are predicted to be **not significant** in the medium term.

175. It will take further time for the restored habitats to mature and provide the habitat conditions required to support associated species. In the medium to long term however (i.e. 10+ years post-management, within the lifetime of the Proposed Development), it is anticipated that the provisions of the OHMP could potentially deliver **significant beneficial** residual effects within the OHMP area.

7.8.1.2 Protected and Notable Species

7.8.1.2.1 Water vole

176. With the application of additional mitigation measures, **no significant residual effects** are anticipated on water vole.

7.8.2 Operational Phase: Residual Effects

7.8.2.1 Protected and Notable Species

7.8.2.1.1 Bats

177. The maximum increase to natural mortality due to bat fatalities which is considered unlikely to have a significant impact on bat populations, and therefore deemed 'incidental', is considered to be two bat fatalities per wind turbine per year. This is based on fatality thresholds applied at German windfarm sites (irrespective of species present) and is usually achievable without excessive losses in power production (yield)^{21,22}. Due to the limited data available on bat populations and bat ecology in Scotland it is not possible to predict exact impacts on bat populations, therefore applying a fatality value from within a European context is the best currently available method of establishing a threshold. With the application of additional mitigation together with ongoing monitoring, it is predicted that bat fatalities would be less than two bats per wind turbine per year. In instances where this is not the case, amendments to the curtailment parameters would be applied. Evidence to support the predicted success of the bat mitigation (i.e. wind turbine curtailment) in sufficiently reducing the risk of bat mortality to an 'incidental' level is presented in **Appendix 7.4 Bat Mitigation Plan**, and on that basis it is anticipated that these measures would be similarly successful at the Proposed Development. While there may potentially still be a small number of occasional bat mortalities over the course of the Proposed Development's lifespan through collision and barotrauma, which may potentially be contributed to by associated landscape changes (felling), the impact on bat populations is

²⁰ <https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Resources/COI%20Forestry%20briefing.pdf>.

²¹ Behr, O. (2015). 'Bat-friendly' operation of wind turbines – the current status of knowledge and planning procedures in Germany. Presentation at Wind Power and Wildlife Symposium, Stirling University.

²² http://www.windbat.techfak.fau.de/tools/index_en.shtml ProBat tool used in Germany to help select curtailment parameters to achieve <2 fatalities / wind turbine / year

anticipated to be **negligible**. Consequently, the residual effects on bat populations are predicted to be **not significant**.

7.8.3 Summary

178. A summary of predicted residual effects is presented in **Table 7.13**.

Feature	Importance	Description of Change (Pre-mitigation)	Nature of Change				Mitigation / Compensation Measure	Residual Effect	
			Beneficial /Adverse	Impact Magnitude	Duration	Reversibility			Significance
Construction									
Bog habitat	Local	Habitat loss/ degradation	Adverse	Low	Permanent	Irreversible	Not significant	Embedded: Avoidance by design and adherence to best practice construction measures. Additional: Restoration and enhancement of bog habitat onsite through the measures prescribed in the OHMP.	Short term: Not significant Medium term: Not significant (offset) Medium-long term: Potential significant beneficial (enhancement)
Dry heath	Local	Habitat loss	Adverse	Low	Permanent	Irreversible	Not significant	None	Not significant
Water vole	Regional	Disturbance/ accidental killing or injury of individuals	Adverse	Low	Short-term	Reversible	Significant	Embedded: Avoidance by design, adoption of sensitive working methods, application of good practice measures, free movement maintained through culverts. Additional: Water vole SPP, derogation licence, trapping and translocation if required.	Not significant
Operation									
Bats species (Nyctalus and soprano and common pipistrelle)	Regional	Collision/ barotrauma or injury	Adverse	High	Long-term	Irreversible	Significant	Additional: wind turbine curtailment and annual monitoring.	Not significant
		Landscape changes	Adverse	High	Long-term	Irreversible	Significant		

Table 7.13 Summary of Residual Effects

7.9 Cumulative Assessment

7.9.1 Introduction

235. The above sections have considered the implications of the Proposed Development on IEFs in isolation from potential effects of other projects and activities. However, the EIA Regulations also require the potential for cumulative effects to be assessed. Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Different types of actions can cause cumulative impacts and effects (taken from CIEEM, 2018). The cumulative effects considered here are 'additive/incremental', this is defined as multiple activities/projects (each with potentially insignificant effects) added together to give rise to a significant effect due to their proximity in time and space. The effect may be additive ($1+1 = 2$) or synergistic ($1+1 = 3$).
236. Only those IEFs upon which potential significant effects are predicted as a result of the Proposed Development (i.e. following the application of embedded or additional mitigation) are considered as part of this Cumulative Impact Assessment. Those IEFs associated with the Proposed Development for which the potential significant effects is not predicted are not expected to significantly contribute to the cumulative effects when considered in combination with those associated with other developments in the wider surrounding area.
237. Consideration has been given to windfarm and non-windfarm related developments within a zone of potential influence (ZoPI), including those which are proposed, consented, under construction or fully operational. Developments at scoping stage have been omitted from the cumulative assessment due to the absence of predicted impacts. In addition, refused or withdrawn developments are discounted, as are small windfarm developments with three or less wind turbines.
238. The ZoPI for terrestrial IEFs has been assessed for at a 10km radius from the Site Boundary. The following windfarms have been considered during the cumulative assessment:
- Dersalloch Windfarm – Operational windfarm of 23 wind turbines located 5.2km north east;
 - Hadyard Hill Windfarm – Operational windfarm of 52 wind turbines located 4.5km west;
 - Kirk Hill Windfarm – Consented windfarm of 8 wind turbines located 9.8km north west;
 - Clauchrie Windfarm – Proposed windfarm of 18 wind turbines located 8.6km south west;
 - Barbae Quarry – Proposed quarry located 9.5km south west; and
 - Craiginmoddie Windfarm – Proposed windfarm of 16 wind turbines located 1km west.
239. It is acknowledged that a proposal for Knockcronal Windfarm comprising 9 wind turbines, is located immediately to the north of the Site Boundary. However, as this proposed windfarm is currently at scoping stage there is not enough information on the ecological and biodiversity impacts from the Proposed Development to include it within this cumulative assessment.

7.9.2 Construction Effects

240. Terrestrial habitats (bog habitats) were identified with residual effects during the construction phase of the Proposed Development and therefore are considered further during the Cumulative Assessment.

7.9.2.1 Terrestrial Habitats

241. Dersalloch Windfarm reports a total loss and/ or degradation of 3.8ha of mire habitat across the Site and 0.7ha of blanket bog. Clauchrie Windfarm reports a total loss of 2ha of wet heath and 2.42ha of dry heath. Craiginmoddie Windfarm reports a total loss of 0.81ha wet modified bog and 0.05ha of blanket bog.
242. In the short term, the loss of approximately 9.36ha of bog habitat resulting from the Proposed Development will initially add to the losses from these other three projects at a local and regional scale. However, the provisions of the OHMP are predicted to off-set this loss such that, in the medium term at least, there will be no significant loss of bog habitat associated with the Proposed Development while in the medium to long term the restoration of an additional 18.64ha of bog habitat may potentially represent a significant beneficial effect on bog habitat. Therefore, the Proposed Development is not considered to contribute any significant adverse residual effects to the cumulative effects from other developments on bog habitat.

7.9.3 Operational Effects

243. Bats were identified with residual effects during the operational phase of the Proposed Development and therefore are considered further during the Cumulative Assessment.

7.9.3.1 Bats

244. Of the EclA reports made available, Hadyard Hill Windfarm had reported negligible residual impacts to bats, Clauchrie Windfarm reported no significant residual effects on bat populations. Craiginmoddie Windfarm reported negligible impact on foraging bats and Dersalloch Windfarm had scoped-out bats from the assessment process. No information was available for the remaining developments listed in **Section 7.9.1**. Due to the proximity of Dersalloch Windfarm and Hadyard Hill Windfarm, paired with the absence of data, the cumulative assessment has been predicted on a precautionary basis. The cumulative effects on bat populations are therefore considered to be **adverse at a low magnitude, short-term** (i.e. the population would likely recover over a single breeding season) and **reversible**.

7.10 Enhancement

245. As stated in **Section 7.7**, as well as offsetting the loss of 9.36ha of bog-type habitat through the construction of the Proposed Development, implementation of the measures prescribed in detailed HMP is also anticipated to result in a net gain of 18.64ha of bog-type habitat. In the medium to long term (i.e. within the lifetime of the Proposed Development) the restoration of this bog habitat may also be expected to result in additional biodiversity enhancements such as the provision of habitat for aquatic and terrestrial invertebrates, common amphibians and ground nesting birds, potentially representing a significant beneficial effect.

7.11 Summary

246. All residual effects to IEFs from construction or operational activities, both in the context of the Proposed Development and in combination with other developments in the wider area are predicted to be no greater than **adverse at a low magnitude, short term and reversible**.
247. **Table 7.13** provides a summary of effects on IEFs which were not mitigated through good practice measures, Proposed Development design or embedded mitigation.

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