7. Terrestrial Fauna

Introduction

7.1 This chapter constitutes the ecology and nature conservation assessment for the Environmental Impact Assessment of a proposed Wind Farm at Carnbuck, in the townlands of Carnbuck, Magheraboy and Moneyneagh, near Corkey, County Antrim, hereinafter referred to as 'the site'. The site occupies the lower slopes of Skerry Hill and the broad valley along the headwaters of Aghanageeragh River. Preliminary Ecological Appraisals (PEAs) were carried out previously for the Site in 2016 and 2018 by Blackstaff Ecology. In part based on these studies, the present proposed layout for up to 12 turbines has evolved. This study addresses the potential impacts on terrestrial fauna of the proposal to erect the turbines and associated access tracks and infrastructure, as described in Chapter 1: Introduction & Proposed Development, hereinafter referred to as 'the Proposed Development'.

7.2 Blackstaff Ecology Ltd was commissioned by RES Ltd to undertake an Ecological Impact Assessment (EcIA) for the proposed wind farm. The Site was re-visited in 2019 to assess any changes that may have taken place since the earlier surveys for the PEA's. With final 'check' surveys for badgers and otter also carried out in early 2022.

7.3 The chapter is supported by:

- Technical Appendix 7.1 – Static Bat Detector Results & Deployment Photos
- Technical Appendix 7.2 - Badger & Otter Survey Report (Confidential)
- Technical Appendix 7.3 – Common Lizard Survey Report
- Figure 7.1 - Automated Static Bat Detector Locations
- Figure 7.2 – Badger & Otter Survey Results (Confidential)
- Figure 7.3 – Common Lizard Survey Results

Statement of Authority

7.4 Initial surveys and assessments for the PEA's were carried out by Dr Brian Sutton, with badger, otter and viviparous lizard surveys carried out by Traci Adams, Dr Erfan Fadaei and Cormac Loughran. Bat detector deployments and bat data analysis were completed by Philip Leathem, who also produced the figures to accompany the impact assessment. An initial site appraisal for bats was carried out by Cormac Loughran, as well as a number of surveys for viviparous lizards and input into the layout design. The chapter was reviewed and impact assessment were also completed by Cormac Loughran and reviewed by Dr Brian Sutton.

7.5 The author of this chapter is (and all surveys were planned by) Cormac Loughran, a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Cormac has worked professionally as a Consultant Ecologist for over 18 years. He holds an MSc (Distinction) in Environmental Management from the

University of Ulster and has extensive experience in a broad range of flora & fauna surveys. He has undertaken and/or coordinated a wide range of ecological surveys and associated impact assessments for over 25 renewable energy projects. Cormac is also an experienced field naturalist and prior to his consultancy work, he worked as a ranger on a number of important nature reserves. As a result, he also has considerable experience of surveying and recording of Irish mammal and herpetofauna and has held numerous licences for same.

7.6 Dr Erfan Fadaei has a BSc (Hons) in Zoology from the University of Manchester and a PhD in deer ecology and management from Queen's University Belfast. Erfan has several years' experience conducting a range of faunal surveys and has conducted numerous badger surveys over the past 2.5 years. He currently works as an ecologist with Blackstaff Ecology Ltd and is a qualifying member of CIEEM.

7.7 Traci Adams has a BSc (Hons) in Zoology (1st class) from the University of Manchester and an MSc in Ecological Management and Conservation Biology from Queen's University, Belfast. She has gained experience within the ecology and nature conservation sector over the past 2 years through volunteering both abroad and in the UK with organisations such as WildlifeSense, The National Trust, Belfast Hills and Lagan Valley Regional Park. Her experience within the Ecological Consultancy sector began in May 2019 when she commenced work with Blackstaff Ecology. Traci has conducted numerous bat transects on single turbine and windfarm developments, as well as working on several bat reports for Blackstaff Ecology.

7.8 Philip Leathem is a GIS/Ecological Technician who has worked in the environmental sector for the past 8 years. Philip's role as a technician includes the maintenance, monitoring and deployment of a suite of automated bat detector units (SM2 Bat+, SMZC's and Anabat Express') which are used during static (bat) monitoring. In addition to the above role, Philip is also a GIS Technician and has considerable experience in the production of Figures for Environmental Statements.

Legislation & Planning Policy

International Treaties, Conventions & Directives

Bonn Convention of the Conservation of Migratory Species of Wild Animals (June 1979)

7.9 The Convention requires the protection of the endangered migratory species listed and encourages separate international agreements covering particular species. An agreement covering the conservation of bats in Europe came into force in January 1994. It deals with the need to protect bats and their feeding and roosting areas.

Bern Convention on the Conservation of European Wildlife and Natural Habitats (September 1979)

7.10 The Convention carries obligations to conserve wild plants, birds and other animals, with emphasis on endangered and vulnerable species and their habitats. The

provisions of the Convention underlie the EC Habitats Directive as well as the UK's wildlife legislation.

UN Biodiversity Convention (The Rio Convention) (June 1992)

7.11 The Convention provides a framework for international action to protect species and habitats. The UK's overall goal under the Convention is to conserve and enhance biological diversity within the UK and to contribute to the conservation of global biodiversity through all appropriate mechanisms.

Convention on Biological Diversity (93/626/EEC) (CBD)

7.12 The Convention requires contracting parties, in accordance with its conditions and capabilities, to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes. It also requires contracting parties to integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectorial and cross sectorial plans, programmes and policies.

EC Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) (The Habitats Directive)

7.13 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EU Habitats Directive) is transposed into law in Northern Ireland by the Conservation (Natural Habitats, etc.) Regulations 1995 (as amended), the Habitats Regulations.

7.14 The Habitats Directive covers habitats and non-avian species of fauna of nature conservation importance and in danger of disappearance, for which the European Commission (EC) has responsibility in view of the proportion of their global range. Habitats are listed and detailed on Annex I of the Directive.

7.15 To conserve these habitats, listed on Annex I of the directive, and species, listed and described on Annex II, a European network of Special Areas of Conservation (SAC) is being established.

7.16 As the Habitats Directive encapsulates a presumption in favour of maintaining Annex I habitats in good conservation status wherever they occur, prior assessment is therefore required to determine whether any areas of habitat within a development site meets the criteria for recognition as Annex I habitat types.

7.17 The Directive also requires appropriate assessment of any plan or project not directly connected with or necessary to the management of a Natura 2000 site, but likely to have significant effects upon a Natura 2000 site, either individually or in combination with other plans or projects.

Annex 1 Habitats

7.18 Blanket Bog (H7130) is listed in Annex I of the EU Habitats Directive as a habitat of European interest. Blanket bog occurs as residual, patchy elements of habitat mosaics, or as more extensive areas dominated by *Eriophorum vaginatum* that

support little *Sphagnum.* The significant presence of extensive *E. vaginatum,* with patchy and/or localised *Sphagnum* suggests that active peat is at least locally present.

7.19 The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats listed in Annex I at a favourable conservation status, introducing robust protection for those habitats of European importance.

Domestic Legislation

Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended)

7.20 The Regulations give effect to requirements relating to the designation of protected sites under the Birds Directive and Habitats Directive. The Regulations provide for the protection and management of European Sites and place obligations on all competent authorities to have regard to the requirements of the Habitats Directive. The Regulations also provide for the protection of species of European importance.

Environment (Northern Ireland) Order 2002

7.21 The Order provides for the designation, management and protection of Areas of Special Scientific Interest (ASSIs). ASSIs may be designated for important geology and land forms as well as for wildlife and habitats. The legislation repeals Part VI of the Nature Conservation and Amenity (Northern Ireland) Order 1985.

Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 (as amended)

7.22 The Order provides for the establishment of National Nature Reserves (NNRs), Nature Reserves (NRs) and Marine Nature Reserves (MNRs). It also provides for the designation and formulation of proposals for National Parks and Areas of Outstanding Natural Beauty (AONBs).

The Wildlife (Northern Ireland) Order 1985 (as amended)

7.23 The Order prohibits the intentional killing, taking or injuring of certain wild birds or wild animals; or the intentional destruction, uprooting or picking of certain wild plants. It also allows for the establishment of Wildlife Refuges (akin to Nature Reserves) for the special protection of certain species of rare plants or animals.

The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009

7.24 The Regulations implement Directive 2004/35/EC and require those carrying out certain activities to prevent, limit and remediate significant environmental damage to protected species, natural habitats, ASSIs, surface water, ground water and land. Operators of activities such as discharges to water sources and water impounding are liable for any significant environmental damage, regardless of whether they intended to cause the damage or were negligent.

Wildlife and Natural Environment Act (Northern Ireland) 2011

7.25 The Act makes provision about biodiversity; amends the Wildlife (Northern Ireland) Order 1985 and Part 4 of the Environment (Northern Ireland) Order 2002; abolishes game licences and game dealers' licences; prohibits hare coursing events and amends the Game Preservation Act (Northern Ireland) 1928.

Planning Policy

Regional Development Strategy (RDS) 2035: Building a Better Future

7.26 The Strategy takes account of European and national policies which would have an influence on the future development of Northern Ireland. The Strategic Planning (Northern Ireland) Order 1999 requires Northern Ireland Departments to have regard to the Regional Development Strategy in exercising any functions in relation to development. There are two types of Strategic Guidance: Regional Guidance (RG) and Spatial Framework Guidance (SFG). RG applies to everywhere in the region and is presented under the three sustainable development themes of Economy, Society and Environment.

7.27 RG 9-RG 12 (Environment) have been adjusted to meet obligations under the Habitats Regulations. Of relevance to the Proposed Development is RG 11: Conserve, protect and, where possible, enhance our built heritage and our natural environment. This Strategy Guidance refers to the need to:

> *'Sustain and enhance biodiversity in line with the objective of the Northern Ireland Biodiversity Strategy to halt the loss of indigenous species and habitats. By protecting existing, or creating new, ecological or wildlife corridors particularly in our cities and towns we can provide valuable help to arrest the decline in biodiversity.'*

and

> *'Identify, establish, protect and manage ecological networks. Ecological networks, including the protection of priority species, are needed to maintain environmental processes and help to conserve and enhance biodiversity. A well-established ecological network, including designated sites, should provide the habitats needed for ecosystems and species populations to survive in an increasingly human dominated landscape. Such networks could also be of amenity value if linked to the green infrastructure provided by walking and cycle routes to heritage and other recreational interest.'*

Strategic Planning Policy Statement for Northern Ireland (SPPS)

7.28 In addition to reiterating the statement made in PPS18 (below) the SPPS States:

> *'Active peatland is of particular importance to Northern Ireland for its biodiversity, water and carbon storage qualities.'*

and

'Renewable energy reduces our dependence on imported fossil fuels and brings diversity and security of supply to our energy infrastructure. It also helps Northern Ireland achieve its targets for reducing carbon emissions and reduces environmental damage such as that caused by acid rain.'

Planning Policy Statement 18: Policy RE1

7.29 Policy RE1 States:

'The wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given significant weight in determining whether planning permission should be granted'.

'Development that generates energy from renewable resources will be permitted provided the proposal, and any associated buildings and infrastructure, will not result in an unacceptable adverse impact on:

(a) public safety, human health, or residential amenity;

(b) visual amenity and landscape character;

(c) biodiversity, nature conservation or built heritage interests;

(d) local natural resources, such as air quality or water quality; and

(e) public access to the countryside.

Where any project is likely to result in unavoidable damage during its installation, operation or decommissioning, the application will need to indicate how this will be minimised and mitigated, including details of any proposed compensatory measures, such as a habitat management plan or the creation of a new habitat. This matter will need to be agreed before planning permission is granted.

Any development on active peatland will not be permitted unless there are imperative reasons of overriding public interest.'

Planning Policy Statement 2 - Policy NH5

7.30 Policy NH 5 - Habitats, Species or Features of Natural Heritage Importance, states:

'Planning permission will only be granted for a development proposal which is not likely to result in the unacceptable adverse impact on, or damage to known:

- priority habitats;
- priority species;
- active peatland;
- ancient and long-established woodland;
- features of earth science conservation importance;

- features of the landscape which are of major importance for wild flora and fauna;
- rare or threatened native species;
- wetlands (includes river corridors); or
- other natural heritage features worthy of protection.

A development proposal which is likely to result in an unacceptable adverse impact on, or damage to, habitats, species or features may only be permitted where the benefits of the proposed development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required.

PPS 21 Sustainable Development in the Countryside

7.31 PPS 21 aims to:

'Manage development in the countryside in a manner consistent with achieving the strategic objectives of the Regional Development Strategy for Northern Ireland 2025." Objectives include to "Conserve the landscape and natural resources of the rural area and to protect it from excessive, inappropriate or obtrusive development and from the actual or potential effects of pollution," and to "Promote high standards in the design, siting and landscaping of development in the countryside.'

Northern Ireland Biodiversity Strategy

7.32 A strategy that has been published by the DoE entitled, Valuing Nature – A Biodiversity Strategy for Northern Ireland to 2020 (01 July 2015) describes 20 targets arising from the 2010 Convention on Biological Diversity (CBD) which was held in Noyoga, Japan during October 2010. A key decision at the Convention was the adoption of a new ten-year strategic plan to guide international and national effort to save biodiversity. The strategic plan, or the Aichi Target, adopted by the meeting is the overarching, internationally agreed, framework on biodiversity. The 20 Aichi Targets form the basis for the Implementation Plan for the NI Biodiversity Strategy. The CBD fully adopted the ecosystem services approach that stresses the need to look at maintaining the functionality of ecosystems as key to protecting biodiversity and delivering benefits for humanity.

Sustainable Development Strategy for Northern Ireland

7.33 The Strategy sets out the Government agenda for ensuring that sustainable practice becomes an integral part of development policy in Northern Ireland. The following six principles of the strategy continue to echo those developed from the previous strategy, and are as follows;

- Living within Environmental Limits;
- Ensuring a Strong, Healthy, Just and Equal Society;

- Achieving a Sustainable Economy;
- Promoting Good Governance;
- Using Sound Science Responsibly;
- Promoting Opportunity and Innovation.

7.34 The strategic objective most relevant to the Proposed Development is: Ensuring reliable, affordable and sustainable energy provision and reducing our carbon footprint.

Guidance on Species/Habitats of Conservation Concern

Red Data Book

7.35 Vascular plant species that are rare and/or threatened on an all-Ireland or European scale have been identified as Red Data Book (RDB) species (Curtis & McGough, 1988).

Northern Ireland Species of Conservation Concern

7.36 NIEA has produced a list of Northern Ireland Priority Species (NIPS) and Species of Conservation Concern (SOCC), which includes Biodiversity Action Plan species, not all of which are Red Data Book species. Rarity is also a criterion for inclusion in the list. NIEA is also in the process of identifying vascular plant species that are of conservation concern as the NI response to the adoption by the UK of the Global Strategy for Plant Conservation (Palmer, 1994). The proposed list will be comprehensive and include species that are near-threatened as well as those protected by the Wildlife Order or listed as NIPS and SOCC. This process of evaluation of the current list of species of conservation concern is on-going.

Local Biodiversity Action Plans (LBAPs)

7.37 Local Authorities have been able to employ Biodiversity Officers, with financial aid from NIEA, since 2004. Their duties include raising awareness of biodiversity issues within local areas, and the development of LBAPs as a means of conserving and enhancing biodiversity at a local scale.

Scope of Assessment

Ecological Impact Assessment

7.38 A wider Preliminary Study Area was surveyed in 2016 and 2018 to establish the main habitat types present, and the results were presented as a Preliminary Ecological Assessment. The reduced study area described in the present report takes into account the results of this earlier preliminary survey and avoids considerable areas of habitats of conservation value identified at that time. Surveys for bats were extended to 200m plus the rotor radius of potential turbine locations, as required by NIEA guidance. Sites designated for their nature conservation features within a radius of 2 km of the Preliminary Study Area (**Figure 6.1**) were also considered to assess

potential remote effects on valuable ecological site-based receptors. Specific study areas for other species are detailed in paragraph 7.47.

7.39 The aim of EcIA is therefore to describe and assess potential significant effects upon ecological receptors (in this case terrestrial fauna) within the planning application boundary and zone of ecological influence within the wider environment, as applicable. This is achieved by informed decision-making in accordance with published methodologies and after collecting a range of primary survey data across the site of the Proposed Development. Identification and evaluation of likely significance of effects associated with the Proposed Development during construction, operation and decommissioning phases permit recommendation of appropriate mitigation measures to avoid and/or reduce the predicted adverse effects of the Proposed Development on the recorded ecological receptors identified as part of the baseline survey.

7.40 The baseline survey, characterisation of the environment and the likely significance of effects of the Proposed Development on habitats, ornithology, fisheries (aquatic ecology) and the water environment are reported upon in **Chapter 6: Vegetation & Peatland, Chapter 8: Ornithology, Chapter 9: Fisheries** and **Chapter 10: Geology & Water Environment**.

Desktop Review

7.41 Consultation was undertaken with the statutory and non-statutory organisations listed below regarding the proposed scope of the EcIA; the location of any statutory and non-statutory designated nature conservation sites that have the potential to be impacted by the Proposed Development; identification of potential ecological receptors; the existence of any ecological records within 2 km of the Preliminary Study Area.

- Centre for Environmental Data & Recording (CEDaR);
- DAERA Natural Environment map viewer;
- Northern Ireland Bat Group;
- National Biodiversity Network (NBN).

7.42 CEDaR and NBN provided biological records.

7.43 NIEA requires the identification of the ecological baseline of the area that will be affected by the scheme and the identification of areas which are likely to be of high conservation value or particularly vulnerable to impact from the proposed scheme. NIEA requires that the EIA should cover both the site and its surroundings, in all seasons.

7.44 The developer will be required to consider the potential impact of the scheme on designated sites. Where there is a potential for impacts on a European protected site (SPA, SAC) the developer will be responsible for informing an HRA as mandated by

Article 6 of EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive").

7.45 The consultation and desk study identified those ecological receptors most likely to be impacted by the proposed wind farm. Ecological receptors identified included; Northern Ireland or European priority and protected species. The ecological surveys and EcIA therefore concentrate on the potential effects of the Proposed Development on these ecological receptors.

Assessment Methodology

Baseline Characterisation of the Study Area

7.46 The study methodology includes both desktop and field survey methods in order to assess the potential impact on the local ecological and nature conservation interest. Features of conservation interest and importance were recorded and their locations are one of the key criteria that affect the wind farm layout. The location of the wind farm infrastructure avoids species of conservation interest where possible, and where this is not possible, mitigation and/or enhancement measures have been incorporated into the design to balance any detrimental impact.

7.47 Signs of mobile species were assessed outside the site to determine their point of origin. The study area was thus extended to take account of the potential for species to use the vicinity of the Proposed Development as part of wider territories or foraging areas. Watercourses within the site, and some tributaries outside the site, were surveyed for signs of otter. Specific study areas for each species are as follows;

- Bats (200m plus rotor radius around proposed turbine locations);
- Otter & badger (planning application boundary + 25-30m buffer);
- Common lizard (site);
- Marsh fritillary (site);

7.48 Sites designated at international, national and local level for their conservation value within a potential impact zone were considered. The nearest designated sites to the study area were identified, to assess the potential for remote effects of the scheme on valued habitats and species outside the immediate area.

7.49 The Fauna section of the EIA considers information gathered from the following sources:

- Consultations, with statutory and non-statutory stakeholders
- Desk study, including review of published/unpublished sources/literature
- A walkover survey of the entire study area and any other areas likely to be affected
- Specialist surveys, as detailed in paragraph 7.50 below
- Assessment of the data acquired

- Consideration of ecological interests in the scheme design and identification of mitigation to be incorporated into the design
- Impact assessment
- Proposed additional mitigation measures to address any likely significant adverse impacts

7.50 The data collection methodology adopted involved both a desktop search and field survey. The relevant statutory and non-statutory bodies were contacted to obtain ecological data for the study area. Records of species of conservation concern in the study area were formally requested from the Centre for Environmental Data and Recording (CEDaR). Detailed surveys were undertaken to establish the baseline conditions of the various habitats and for the species groups that are likely to occur around the proposed scheme. The purpose of an ecological survey is to identify 'valued ecological receptors', those species and habitats that are especially valued in some way for their ecological function, their contribution to biodiversity or are protected by specific legislation. The following specialist surveys were undertaken:

- Bat (Chiroptera spp) survey
- Otter (*Lutra lutra*) survey
- Badger (*Meles meles*) survey
- Common Lizard (*Zootoca vivipara*) survey
- Marsh Fritillary (*Euphydryas aurinia*) habitat survey

Bat Survey Methodology

7.51 NIEA recommends different types of guidance for bat surveys, depending on the type of proposal. In the case of the proposed development this includes the SNH guidance (Jan 2019) entitled '*Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation'*. Therefore, this guidance was used when arriving at the appropriate level of survey effort (for both automated and manual surveys) at the windfarm.

7.52 A desk study was undertaken in order to plan survey work and provide context for this assessment. The desk study included a review all the available information on bats relevant to the proposed wind farm and considered the various factors that influence risk to the species at a site. This included:

- The use of bespoke UAV aerial imagery (a ground truthing site visit), topographical maps and habitat survey maps (from a previous Preliminary Ecology Assessment) of the proposed site to identify features of potential value to bats.
- The collation of relevant bat information within 10 km of the proposed wind energy site, including species and roost records and the proximity of national and internationally designated sites for bats.
- Particular efforts were made to identify locations with the potential to house significant roosts, such as barns and other buildings.

- The location of other wind energy developments, including the number of turbines and their size, within the surrounding 10km in order to inform an assessment of cumulative pressure.

7.53 Collins (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition) was also considered during survey design and the subsequent survey effort.

7.54 It was noted that:

- Habitat quality is poor for bats on the site due to the presence of largely low-quality foraging habitat for bats (blanket bog and upland heath) across the majority of the site. There are some areas of moderate quality foraging habitat, namely a stream valley which bisects the site, and Slieveanorra Forest – a coniferous plantation – which lies approximately 600m north of the most northerly proposed turbine location.
- The site has an exposed aspect;
- The site is not proximal to sites designated for bats; and,
- No buildings or other structures known to support bats are extant on the site[1].

7.55 Based upon this information, and upon the factors noted in the aforementioned SNH Guidance, the site was deemed to be of 'low quality' for bats and the following survey standard was implemented in accordance with SNH Guidelines.

- Survey Area of up to 200m plus the rotor radius from the proposed turbine locations;
- Ten consecutive nights of static monitoring per turbine location during each season (spring/summer/autumn) using broadband passive recorders.

7.56 The site occupies a broad valley with generally shallow to moderate slopes, although steeper slopes are present on the higher ground along the southern valley side. The study area comprises a range of habitats, namely heath, bog, acid flush, grassland and running water. The wider landscape is similar to the site with extensive areas of open moorland and sheep grazed pasture, while a conifer plantation exists to the north east.

7.57 A detailed survey of potential roosting features within 200m of the application site boundary was carried out during 2019. The habitat survey did not identify any buildings or structures with potential roosting features. Few trees are present in proximity turbines however no mature trees suitable for use by roosting bats are extant within the application boundary. The majority are isolated and deemed unsuitable for roosting bats.

7.58 Overall, the site is identified as being of Low-risk due to the presence of largely low-quality foraging habitat (and limited opportunity for roosting) for bats; with even the areas normally described as moderate quality foraging habitat (i.e., rivers and

[1] within 200m plus rotor radius of the proposed turbine locations.

streams) located in a fairly isolated upland context with no trees (or sheltered areas) and limited invertebrate prey.

Automated Bat Activity Surveys

7.59 Automated passive monitoring was also undertaken during spring (15 Apr – 15 Jun), summer (15 Jun – 15 Aug) and autumn (15 Aug – 15 Oct) 2019 (**Technical Appendix 7.1** and **Figure 7.1: Static monitoring locations**). Several (calibrated) broadband ultrasonic bat detectors (SM2BAT+ and Anabat Express) were placed to record for a minimum of ten nights at numerous locations across the site on a seasonal basis, including a number of potential turbine locations. Each static detector was programmed to automatically operate during set time periods to record bat activity between dusk and dawn each night.

7.60 The SNH 2019 guidance states that;

> *''Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments''.*

7.61 At Carnbuck, all 12 proposed turbines were monitored, which yielded a total of 360 hours of recording time (May to September inclusive). This was done in order to allow for alterations to the proposed turbine layout (which often occur during the assessment process) and to allow for equipment failure or damage.

7.62 Detectors were placed with the microphone directed at a 90^{o} angle towards the area to be monitored (e.g. the proposed turbine location). Whenever possible microphones were placed on a fence post or pole. This helps to prevent recording extraneous noises and places the microphone closer to or within the flight path of the bats; this tends to provide higher quality recordings.

7.63 AnalookW and Kaleidoscope Pro UK was used to undertake analysis of data collected during automated passive monitoring. Bat activity was measured using the number of files containing a bat call or bat call sequence irrespective of length, for a complete night of recording. Passive monitoring enables determination of species composition and temporal activity patterns between different times of year and different times of night at a fixed-point location. Bat activity indices (for all survey types) are provided in the survey results, included in **Technical Appendix 7.1**.

Otter Survey

7.64 An otter survey was conducted, extending to 30m around the planning application boundary on the 14 and 18 October 2019, using the methodology described in the NIEA survey requirements (NIEA 2017[2]). The survey area was thoroughly searched for both direct and indirect evidence of otters. Such evidence included: prey remains, spraints, footprints, slides and dens. The locations of any features were noted using a handheld GPS. Where excavations were discovered, the survey detailed; the

[2] https://www.daera-ni.gov.uk/sites/default/files/publications/daera/otter-survey-specifications.pdf

direction of tunnelling; and the degree of use at the time of the survey. Where trails were found, these were followed to the edge of the recording area.

7.65 Further otter surveys were conducted on the 15 February and 01 March 2022 after the infrastructure layout was frozen in order to check that there had been no changes on the ground since the 2019 surveys were conducted.

Badger Survey

7.66 A badger survey was conducted at the site on 14 and 18 October 2019. The search area on these dates comprised 25 m surrounding the planning application boundary as well as the banks of the water course that runs through the northern section of the site.

7.67 The survey followed the methodology described in Harris et al (1989[3]) and with reference to the NIEA survey requirements (NIEA 2017[4]). The survey area was thoroughly searched for both direct and indirect evidence of badger activity. Such evidence included: badger hairs; mammal pathways of suitable dimension; gaps of suitable dimension in fences or hedgerows; snuffle holes indicating foraging activity; tracks; latrines; and excavations of suitable dimensions to host badgers. The locations of any features were noted using a handheld GPS. Where excavations were discovered, the survey detailed;

- The number of entrances present;
- The shape of tunnel entrances;
- The width of the tunnel entrance at its widest point (visible);
- The direction of tunnelling; and
- The degree of use at the time of the survey, i.e. active or inactive.

7.68 Further badger surveys were conducted on the 15 February and 01 March 2022 after the infrastructure layout was frozen in order to check that there had been no changes on the ground since the 2019 surveys were conducted.

Viviparous Lizard Survey

7.69 On assessing the habitats present on the application site it was considered that there is a high likelihood of viviparous lizards being present. Therefore, in order to ensure that the proposed development complies with legislation and planning policy, a survey for this species was carried out. The work was carried out during April 2019 and aimed to establish whether lizards are present within the construction corridor and surrounding area.

7.70 The methodology includes both visual searches and the use of artificial refugia. Surveys were carried out during the following optimal periods;

- Early spring - middle hours of the day (c.11am-3pm);

[3] Harris, S., Creswell. P., and Jefferies, D.J., 1989. Surveying badgers. Mammal Society, London.
[4] https://www.daera-ni.gov.uk/sites/default/files/publications/daera/bat-survey-specifications.pdf

- Late spring – mid morning (c.9-11am) and late afternoon (c.4-6pm), and/or;
- Summer – short periods in morning (c.7-9am) and evening (6-8pm); hot weather can produce totally negative results;
- Autumn similar to spring timings.

7.71 During the visual searches a transect was walked slowly, scanning sunny sides of vegetation while keeping the sun behind you or to your side. Particular attention was paid to vegetation interfaces (i.e. habitat edges, where bracken meets heather or grassland) as these are often places where reptiles bask (as they seldom venture far from dense cover for protection).

7.72 The walked transects also made use of natural basking spots, however artificial refugia in the form of 30 number rubber backed carpet tiles (500 x 500 mm) were also placed around most of the proposed turbine locations (see **Figure 7.3** and Volume 4: **Technical Appendix 7.3**). The transect also took account of suitable habitat within or adjacent to the construction corridor. The following was applied to the emplacement of refugia;

- Choose sunny locations away from public view and livestock;
- Press refugia down close to the ground;
- Use deep cover or edge of dense vegetation;
- Do not deploy on bare ground/sparse cover;
- Lift and replace refugia carefully taking care not to squash retreating animals.

7.73 Surveys were carried out during suitable weather conditions (as above), and focussed during April and September 2019. The surveys were 2-3 hours in duration and three visits were made (with the first visit at least a week after the refugia were laid).

Marsh Fritillary Habitat Assesment

7.74 A devil's-bit scabious *Succisa pratensis* survey was undertaken as part of both the JNCC Phase 1 & NVC Phase 2 habitat surveys (2016, 2018 & 2022) in accordance NIEA recommendations (arising out of their consultation response) to establish the presence/abundance within the Site of devil's-bit scabious, which is main food plant of the marsh fritillary butterfly.

Argent & Sable Habitat Assessment

7.75 A bog myrtle *Myrica gale* survey was undertaken as part of the Phase 1 habitat survey (during both 2016 and 2018) in accordance NIEA recommendations (arising out of their consultation response) to establish the presence/abundance within the Site of bog myrtle, which is main food plant of the argent & sable moth.

Ecological Impact Assessment

7.76 The assessment of the impact of a scheme on a species or habitat must consider the conservation value of the species or habitat. This assessment of the potential impact

of the Proposed Development on the conservation interest of the construction area and associated access routes adopts the Guidelines for Ecological Impact Assessment in the UK (CIEEM 2022).

7.77 The objective of the EIA process, in relation to the natural environment, is to undertake sufficient assessment to identify and quantify any significant impacts on the natural environment likely to arise from turbine construction, operation and eventual decommissioning. Following identification of the final infrastructure layout, the baseline ecological (or biodiversity) conditions in the site are described, based on information provided by consultees, background sources of information and the results of dedicated surveys carried out for the scheme.

7.78 As a means of achieving this objective, ecological constraints on development of the scheme at international, national, regional and local levels are identified and assessed. This includes the main ecological features that should be avoided or that could affect the design of the scheme or delay progress.

Sensitivity Criteria

7.79 Potential significant impacts are assessed according to the ecological value of a site, which is derived from the criteria outlined below. The sensitivity (importance) of a receiving habitat is defined by its position in a hierarchy of site importance and conservation value. This hierarchy extends, highest to lowest, from International, National, Regional, Local, to negligible importance. This range of values is expressed in the protection afforded a site by international and national legislation, and in planning policy at a more local level (**Table 7.1**).

7.80 The biodiversity value of a site, is measured by such factors as:

- animal or plant species, subspecies or varieties that are rare or uncommon, either internationally, nationally or more locally;
- endemic species or locally distinct sub-populations of a species;
- ecosystems and their component parts, which provide the habitats required by the above species, populations and/or assemblages;
- habitat diversity, connectivity and/or synergistic associations (e.g. networks of hedges and areas of species-poor pasture that might provide important feeding habitat for rare species);
- notably large populations of animals or concentrations of animals considered uncommon or threatened in a wider context;
- plant communities (and their associated animals) that are typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities;
- species on the edge of their range, particularly where their distribution is changing because of global trends and climate change;
- species-rich assemblages of plants or animals; and
- typical faunal assemblages that are characteristic of homogeneous habitats.

7.81 The secondary value of a site can be as part of a corridor or a series of stepping stones that facilitate the migration, dispersal and genetic exchange of wild species, or as a buffer zone that protects a valued site from adverse or beneficial environmental impacts.

Magnitude of Effect

7.82 This relates to the magnitude of the impacts on the features during the construction, operation and decommissioning phases. The magnitude of ecological impacts is assessed by considering the change in the ecology of a site that will arise because of the direct and indirect effects of a development on that ecology. Factors to be considered when considering the magnitude of an impact are outlined in **Table 7.2**. The criteria for determining the magnitude of impact are listed in **Table 7.3**. Both direct and indirect impacts, and the duration of these impacts are examined.

Significance Criteria

7.83 This relates to the significance of impacts on species and habitats of conservation importance, based on their presence as determined by survey. Factors to be considered when assessing the ecological significance of impacts are outlined in **Table 7.4**. Taking the factors in **Table 7.4** into account the significance of an impact may be broadly categorised according to **Table 7.5**.

Table 7.1: Criteria for assessing ecological sensitivity/importance at a geographic scale

Value/Importance	Criteria
Internationally important sites (very high conservation value)	World Heritage Sites identified under the Convention for the Protection of World Cultural & Natural Heritage, 1972. Biosphere Reserves identified under the UNESCO Man & Biosphere Programme. Wetlands of International Importance designated as Ramsar Sites under the terms of the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) formulated at Ramsar, Iran, in 1971. Special Protection Areas (SPAs) designated in accordance with the 1979 European Communities Directive on the Conservation of Wild Birds (79/409/EEC): The Birds Directive. This Directive requires member states to take measures to protect birds, particularly rare or endangered species as listed in Annex I of the Directive, and regularly occurring migratory birds. Special Areas of Conservation (SACs and cSACs) designated in accordance with the 1992 European Commission Habitats Directive 92/43/EEC (1992): The Habitats Directive. This Directive requires member states to establish a network of sites that will make a significant contribution to conserving habitat types and species identified in Annexes I and II. Other sites maintaining habitats and/or species listed under the Birds and/or Habitats Directives (see above). Sites hosting significant populations of species annexed under the Bonn Convention. Sites hosting significant populations annexed under the Bern Convention. Biogenetic Reserves (UNESCO Man and the Biosphere Programme).
Nationally important sites (high conservation value)	Areas of Special Scientific Interest are the principal national designation for sites of nature conservation interest. They are notified under Section 28 of the Environment (NI) Order 2002 and are chosen by virtue of any of their

Value/Importance	Criteria
	flora, fauna, geological, or physiographic features to represent the best national and regional example of natural habitat, physical landscape features or sites of importance for rare or protected species. National Nature Reserves (NNRs) and Marine Nature Reserves (MNRs) are designated under the Environment Order. Sites maintaining UK Red Data Book species that are listed as being either of unfavourable conservation status in Europe, of uncertain conservation status or of global conservation concern. Sites maintaining species listed in Schedules 1, 5 and 8 of The Wildlife (NI) Order 1985, as amended.
Regionally important sites (medium conservation value)	Sites that reach criteria for Local Nature Reserve but do not meet ASSI selection criteria. Sites of Local Importance for Nature Conservation (SLNCIs) are recognised by Planning Service and are intended to complement the network of nationally and regionally important sites. SLNCIs receive special consideration in relation to local planning issues. Sites supporting viable areas or populations of priority habitats/species identified in the UK Biodiversity Action Plan or smaller areas of such habitat that contribute to the maintenance of such habitat networks and /or species populations. Sites maintaining habitats or species identified in Regional Biodiversity Action Plans based on national rarity or local distribution. Other sites of significant biodiversity importance (e.g. sites relevant to Local Biodiversity Action Plans).
Local (lower conservation value)	Sites not in the above categories but with some biodiversity interest. Examples of lands of lower ecological value include; intensive agricultural lands and coniferous forestry.
Negligible conservation value	Sites with little or no local biodiversity interest.

Table 7.2: Factors to be considered when assessing magnitude of ecological impacts

Parameter	Description
Extent	The area over which an impact occurs.
Duration	The period required for a feature to recover or be replaced following an impact. Duration of an activity may have a shorter duration than the impact of the activity.
Reversibility	A permanent impact is one from which recovery is unlikely within a reasonable timescale. A temporary impact is reversible either through natural recovery or because of mitigation.
Timing and frequency	In some cases, an impact may only occur if it occurs during a critical season or part of a species' life-cycle, and may be avoided by careful scheduling of work activities. Frequency of an activity may also affect the magnitude of its impact by reinforcement of the impact.

Table 7.3: Criteria for assessing magnitude of ecological impact

Significance	Description
Severe adverse	The development fails to satisfy the subject environmental objective and results in major fundamental deterioration of the environment at national and international levels of importance. Proposed development activities will result in a major alteration to the baseline ecological conditions, resulting in fundamental change and major environmental deterioration.

Significance	Description
	Large adverse impacts are attributed to any significant adverse impact on habitat and species (or other valued ecological receptors) identified as being of International significance. Highly significant impact, warrants refusal of planning permission.
Major adverse	The proposal (either on its own or in-combination with other proposals) may adversely affect the site, in terms of coherence of its ecological structure and function, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest.
Moderate adverse	The site's integrity will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If it cannot be clearly illustrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as a major adverse.
Minor adverse	Neither of the above applies, but some minor adverse impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not yet available).
Negligible	Very minor alteration to one or more characteristics, features or elements.
Neutral	No observable impact in either direction.

Table 7.4: Factors to be considered when assessing ecological significance of impacts

Factor	Defining criteria
Site integrity	Extent to which site/ecosystem processes will be removed or changed. Effect on the nature, extent, structure and function of component habitats. Effect on the average population size and viability of component species, size and viability of component species.
Conservation status	Habitats: conservation status 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 functions as well as the long-term survival of its typical species within a given geographical area. Species conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area. Conservation status may be evaluated for any defined study area at any defined level of ecological value. The extent of the area used in the assessment will relate to the geographical level at which the feature is considered important.
Probability of expected outcome	Known or likely trends and variations in population size/habitat extent. Likely level of ecological resilience.

Table 7.5: Significance of impacts

Significance	Description
Severe adverse	The proposal (either on its own or with other proposals) is likely to adversely affect the integrity of a European or nationally designated site, in terms of coherence of its ecological structure and function, across its whole area, that enables it to sustain the population levels of species of interest, or is likely to adversely affect the numbers, distribution or viability of a species or population of conservation concern. A major change in a site or feature of local importance may also enter this category.
Major adverse	The integrity of a European or nationally designated site will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly illustrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as very large adverse.

Significance	Description
Moderate adverse	The proposal may adversely affect the integrity of a locally important conservation site, or may have some adverse effect on the numbers, distribution or viability of a species or population of conservation concern.
Minor adverse	None of the above applies, but some minor negative impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not yet available).
Neutral	No observable impact in either direction.
Minor beneficial	The development partly satisfies the subject environmental objective and partly contributes to the environmental context. Proposed development activities will result in minor improvements to baseline ecological conditions and should result in minor environmental gains. Slight beneficial impacts can be attributed to benefits to any valued ecological receptors. Environmental gains which can easily be achieved through standard practices.
Moderate beneficial	The development satisfies the subject environmental objective and contributes to the environmental context. Proposed development activities will result in recognisable improvements to baseline ecological conditions and will result in notable environmental gains. Moderate beneficial impacts can be attributed to benefits to any valued ecological receptors where improvements are expected to be significant. Environmental gains which require detailed design consideration – potentially employed to offset slight/moderate adverse impacts elsewhere.
Major beneficial	The development satisfies the subject environmental objective and results in a major contribution to the environmental context. Proposed development activities will result in quantifiable improvements to baseline ecological conditions and will result in significant environmental gains. Large beneficial impacts are only attributed to substantial benefits to valued ecological receptors identified as being of National or International importance and where such benefits will result in the consolidation and/or expansion of areas of habitats or ensure the security and/or expansion of viable populations of species. Environmental gains which require very detailed design consideration – potentially employed to eliminate and offset potential significant adverse impacts elsewhere.

7.84 Cumulative impacts may also arise. Other projects that have been included in the cumulative impact assessment are:

- Wind farm projects which have received planning consent; and
- Other development projects with valid planning permissions, and for which formal EIA is a requirement or for which non-statutory EIA has been undertaken. The cumulative impacts of different projects are assessed against the significance criteria outlined in **Table 7.6**.

Table 7.6: Criteria for assessing the significance of cumulative effects

Significance	Effects
Severe	Effects that the decision-maker must consider as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.

Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Baseline Conditions

Desk Study Results

7.85 The results of the desk study detail designated nature conservation sites and/or ecological records of protected species or species of natural heritage importance within 2 km of the Planning Application Boundary.

Plants of additional conservation interest

7.86 The food plant (devil's-bit scabious *Succisa pratensis)* of the marsh fritillary butterfly *Euphydryas aurinia* is present locally at a low density outside the Planning Application Boundary, and is sparsely present in the vicinity of Turbines 10 and 12.

7.87 No examples of bog myrtle *Myrica gale* (food plant for the larvae of the argent and sable moth *Rheumaptera hastata*, a UK priority species) were found on the site.

Site Overview

7.88 The site is located in Country Antrim, and occupies a broad valley between Slievenhanaghan and Skerry Hill, aligned northeast to southwest with generally shallow to moderate slopes, although steeper slopes are present on the higher ground along the western side of Skerry Hill, rising to around 440m close to its summit. Slieveanorra Forest lies to the immediate north, and the Aghanageeragh River flows through the site towards the southwest.

Designated Nature Conservation Sites

Internationally Designated Nature Conservation Sites

7.89 The boundary of the Antrim Hills Special Protection Area (SPA) is separated from the northern limit of the Site by the Altnahinch Road, and then extends along part of the eastern boundary of the Site. Antrim Hills SPA qualifies under Article 4.1 of the Birds Directive (79/409/EEC – 2009/147/EC (Consolidated Version)) by supporting nationally important populations of hen harrier *Circus cyaneus* and merlin *Falco columbarius*.

7.90 Garron Plateau Special Area of Conservation (SAC) is an extensive upland site that approaches the Site to within 5.9km to the southeast. Primary reasons for the designation of the SAC are the presence of the Annex I habitats active blanket bog and alkaline fens, and the presence of the Annex II species marsh saxifrage *Saxifraga hirculus*. Annex I habitats that are present as qualifying features but are not primary reasons for designation are:

- oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*;

- natural dystrophic lakes and ponds;
- Northern Atlantic wet heaths with *Erica tetralix*; and
- transition mires and quaking bogs.

7.91 The Garron Plateau is also a Ramsar Site, designated under the Ramsar Convention. The site fulfils Criterion 1 of the Convention as it can be considered an internationally important wetland as it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region. The site is a large and relatively intact example of a blanket bog and one of the best examples of this habitat in the UK. It also contains nationally important examples of transitional and alkaline fen and oligotrophic/mesotrophic lakes. It also fulfils Criterion 2 of the Convention as an internationally important wetland that supports vulnerable, endangered, or critically endangered species or threatened ecological communities. The site supports at least six species listed in the Irish Red Data Book-Vascular Plants and up to five species of birds (one of which breeds in nationally important numbers) which are listed in the Irish Red Data Book.

7.92 Main Valley Bogs SAC is 6.6km to the west of the Site. The SAC has been designated for the presence of active raised bogs, an Annex I priority habitat.

Nationally Designated Nature Conservation Sites

7.93 Slievenorra and Croaghan ASSI occupies much of the same area as the northern part of the Antrim Hills SPA. However, the nearest point of the ASSI to the Site is 1.6km to the west. Designation features of the ASSI are blanket bog, montane heath and the breeding populations of hen harrier and merlin.

Locally Designated Conservation Sites

7.94 Aghengerragh River Bog Site of Local Nature Conservation Importance lies partly within the site and occupies approximately 215ha of the land under applicant control (LUAC) (~51% of total area). This site consists of blanket bog habitats on the higher ground in the northeast of the Proposed Development Site.

7.95 Carnagal Local Wildlife Site, which contains MG5 grassland is situated approximately 1.6km to the west of the site.

7.96 There are no Ancient Woodland Inventory (AWI) woodlands within 250m of the site.

7.97 The locations of designated sites are shown in **Figure 6.1**.

Species Action Plan species

7.98 Several non-avian species for which NIEA has published Species Action Plans (SAPs) occur or may occur in the study area. SAP species that are known to occur or may occur at the site include; Irish hare, all bat species (the subject of an all-Ireland SAP) and otter. Occurrence of and significance of impact on these species are discussed below.

Existing Biological Records (NIPS)

Mammals

7.99 There are CEDaR records of pine marten *Martes martes* and red squirrel *Sciurus vulgaris* from Slieveanorra Forest, otter from the Bush River and Skerry Water, badger from East Skerry and bats from south Slievenanee.

Other taxa

7.100 Small heath *Coenonympha pamphilus*, is an additional priority species found within 1km of the site.

Species Baseline

Bats

7.101 A site visit was undertaken during April 2019 to consider the potential value of habitats and landscape features within 200 m of the proposed turbine locations (i.e. the bat study area). The presence of any features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large catchment) within 200 m plus rotor radius of the proposed turbine locations was also considered.

7.102 The landscape surrounding the site consists of several features that have potential to provide habitat for bats, notably open moorland, acid grassland, as well as several watercourses. However, overall habitat quality for bats is poor due to a combination of the exposed nature of the site, habitat types and grazing pressure from livestock which has resulted the site having very limited shelter and vegetation in order to provide suitable foraging conditions.

7.103 Thence, the overall foraging potential of the study area is considered 'poor' as it comprises mostly heavily grazed degraded blanket bog, heath and marshy grassland. However, the site is connected to the wider landscape by linear features (i.e., minor watercourses) that could be used by commuting bats. Landscape features such as watercourses can be seen on the aerial photography in Figure 7.1: Static Monitoring Locations. Habitat types are shown in Figure 6.2: JNCC Phase 1 Habitat Survey Map.

7.104 The overall potential of the site was of 'low' value taking into consideration the landscape of the general area, the habitats and landscape features identified on the site, the distance from the proposed turbines and the potential use of the site by bats for roosting, foraging and/or commuting.

Automated Passive Monitoring

7.105 Automated passive monitoring was undertaken at the site across spring, summer and autumn during 2019. Monitoring took place at all turbine locations (see **Figure 7.1 – Static Monitoring Locations**).

7.106 Across the three seasons (spring, summer & autumn), automated monitoring was carried out for 30 nights at each turbine (estimated total hours = 3360 hours (based on an average of eight hours recording per night (although night length varies across the survey season)). Bat species recorded during automated passive monitoring included; common pipistrelle, soprano pipistrelle, pipistrelle spp., Nathusius pipistrelle, Leisler's bat, Myotis species. (*Myotis daubentonii, M. nattereri* and *M. mystacinus*) bat are the most difficult species to identify and are therefore collectively referred to as Myotis bats (Russ 19995 & Russ 2012[6])), as well as a few records for brown long-eared bat.

7.107 **Technical Appendix 7.1** contains Bat Activity Indices (BAI) for the static surveys, broken down by proposed turbine location. These indices are based on the total number of files (containing a recording) of each species, divided by the total number of survey hours for that location.

Table 7.7: Description of levels of bat activity (adopted from Mathews et al., 2016)

Description	Bat Activity Index	Interval between passes
Negligible	<1	>60 minutes
Low	1 – 5	12 – 60 minutes
Moderate	5 – 12	5 – 12 minutes
High	12 – 60	1 – 5 minutes
Near-constant	>60	<1 minute

7.108 Overall, during the total of 360 nights of monitoring, bat activity was either negligible; low or with no bats having been recorded (**Technical Appendix 7.1** contains a detailed breakdown of activity at each turbine during each night of monitoring). However, on two nights (02 Aug 2019 at T7 and T9; 07 Aug 2019 at T8 and T12) the BAI (Bat Activity Index) exceeded 5.0. Therefore, a BMMP (Bat Monitoring Mitigation Plan) has been recommended.

Other Mammals

Otter

7.109 The presence of this species within the site was confirmed during otter surveys, via the locating of a single otter spraint. However, there were no otter holts or other field signs recorded. The watercourses within the site are small upland streams, which are devoid of any significant riparian vegetation. However, these small rivers flow downstream into the River Main which is home to otters. Therefore, there is the

[5] Russ, J. (1999) *The Bats of Britain and Ireland, Echolocation Calls, Sound Analysis and Species Identification*, Alana Ecology Ltd, Shropshire.
[6] Russ, J. (2012) *British Bat Calls, A Guide to Species Identification*, Pelagic Publishing, Exeter.

potential for otters to come upstream during dispersal of young animals or when travelling between the numerous minor catchments within the wider catchment.

Badger

7.110 The results of the badger survey are presented in (confidential) **Technical Appendix 7.2**.

Herpetofauna

Viviparous Lizard

7.111 Lizard *Lacerta vivipara* surveys commenced when the first thirty (500x500mm artificial refugia) were placed across the site on the 04th April 2019. These were left in-situ for at least a week to allow the lizards to become acclimatised to their presence. This coincides with the NIEA Specific Requirements (in force at the time of survey) for this species, which states that "surveys should be carried out between March and October. With the best time for surveys to be undertaken is generally April-May and in September."

7.112 **Table 7.8** (below) outlines the results of the lizard surveys undertaken in September 2019.

Table 7.8: Results of the common/viviparous lizard surveys carried out during 2019

Date/Time	Weather	Results
13/05/19	13ºC Some cloud but mostly clear, intermittent light showers and sunny spells	6 lizards (5 from refugia; 1 along the walked transect)
12/09/19	14ºC Some cloud but mostly clear and sunny spells	10 (7 recorded from refugia; 3 recorded along the walked transect)
19/09/19	14ºC sunny and calm	11 (10 recorded from refugia; 1 recorded along the walked transect)

7.113 A maximum total of 10 adult lizards were recorded using a total of nine refugia (see **Figure 7.3**). The results of the common lizard surveys reveal a population score of 2 (good population[7)] (5-20 individuals recorded). It is likely that the habitats surrounding T6 as well as adjacent to T7, T9 and T11 are optimal habitat for this species. Whereas the habitats surrounding T1 – T5 are poorer quality habitat for common lizard (i.e., more heavily grazed). Finally, the habitats surrounding T10 and T12 are likely to be less optimal (due to heavier sheep grazing) but that lizards are likely to be present (at lower population densities).

[7] Froglife Advice Sheet 10 Reptile Survey, an introduction to planning, conducting and interpreting surveys for snake and lizard conservation

Assessment of Impacts

General

7.114 Having defined the ecological baseline characteristics of the study area, it is necessary to describe the potential resultant scheme-related changes to the baseline and to assess the impact on valued ecological resources (CIEEM 2018)[8]. The process of identifying impacts refers to aspects of ecological structure and function on which a resource feature depends. Examples of aspects of ecological structure and function to consider when predicting impacts include (CIEEM 2018):

- Available resources (Territory: hunting/foraging grounds; shelter and roost sites; breeding sites; corridors for migration and dispersal; stop-over sites);
- Stochastic processes (Flooding, drought, wind blow and storm damage, disease, eutrophication, erosion, deposition and other geomorphological processes, fire and climate change);
- Ecological processes (Population dynamics: population cycles; survival rates and strategies; reproduction rates and strategies; competition; predation; seasonal behaviour; dispersal and genetic exchange; elimination of wastes. Vegetation dynamics: colonisation; succession; competition; and nutrient-cycling);
- Human influences (Animal husbandry, cutting, burning, mowing, draining, irrigation, culling, hunting, excavations, maintenance dredging, earth shaping, ploughing, seeding, planting, cropping, fertilising, pollution and contamination, use of pesticides and herbicides, introduction of exotics, weeds and genetically modified organisms and disturbance from public access and recreation, pets and transport);
- Ecological relationships (Food webs, predator-prey relationships, herbivore-plant relationships, herbivore-carnivore relationships, adaptation and dynamism);
- Ecosystem properties (Fragility and stability, carrying capacity and limiting factors, productivity, community dynamics; connectivity; source/sink; numbers in a population or meta-population, minimum viable populations; sex and age ratios; patchiness and degree of fragmentation);
- Ecological role or function (decomposer, primary producer, herbivore, parasite, predator, keystone species).

7.115 Impacts on ecosystem structure and function are assessed by reference to the following parameters:

- Positive or negative impacts, with international, national and local policies increasingly pressing for projects to deliver positive biodiversity outcomes
- Magnitude, or size of an impact, which in the case of habitat may be coincident with extent

[8] Chartered Institute of Ecology & Environmental Management (CIEEM) (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (September 2018)*.

- Extent over which an impact is felt
- Duration of time over which the impact is expected to last prior to recovery or replacement of the resource or feature
- Reversibility, or whether an impact is permanent or temporary
- Timing and frequency of an activity, which may have different impacts depending on, for example, the season during which it is carried out.

7.116 EIA legislation requires the enumeration of significant negative or positive impacts of an activity on ecological features. An ecologically significant impact is here defined as an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area (CIEEM 2018). The significance of an impact depends on the importance of a receptor as defined in **Table 6.1** and on the magnitude of the impact on that receptor as defined in **Table 6.2**. Receptor impacts may be averaged against each other to assess the significance of the impact of the scheme on the site's natural environment, but in some cases a single receptor, for example an internationally important species or habitat, may be of sufficiently critical importance that the magnitude of impact on that single receptor defines the significance of the impact on the site. The following narrative assesses the significance of the impact of the Proposed Development.

Construction Phase

7.117 Activities that may be associated with construction of the Proposed Development and that may generate impacts on the natural environment near the proposed scheme include:

- Disturbance of designation features/designated sites;
- Disturbance to protected species;
- Construction of hard surfaces for access roads, turbine bases and construction platforms;
- Construction on new ground, leading to habitat and population constriction and/or fragmentation;
- Storage of materials and plant, and construction of site compounds;
- Environmental incidents and accidents (e.g. spillages, noise and emissions;
- Excavation works;
- Removal and redistribution of topsoil and subsoil;
- Provision of temporary access routes;
- Disruption or modification of drainage;
- Vegetation clearance; and
- Implementation of landscape design and habitat management.

7.118 The significance of the potential effects of the proposed scheme on valued ecological receptors during the construction phase has been assessed and outlined in the following sections.

Bats

7.119 Construction activities have the potential to remove foraging habitat or reduce its value, and to disrupt flight-lines. Studies in Britain indicate that most bat activity is near habitat features. Activity declines with distance from features such as treelines and woodland edge and is generally not significant at distances greater than 50 m (Natural England 2014[9]). This decline occurs both when bats are commuting and when foraging, although the decline is greater when animals are commuting. The potential impact of loss of feeding habitats may vary seasonally, with greater impact during the summer, and lower impact during migration.

7.120 Low numbers of bats were recorded foraging over the site, while the main bat foraging and commuting routes have all been avoided during the emplacement of infrastructure. A few river crossings will be required during construction, and therefore this may cause some limited disruption to foraging areas. However, most bat activity will likely continue as the main areas of better foraging along the wooded escarpment edges will remain untouched during construction activities and key commuting routes will therefore be unaffected.

7.121 The other main potential impact on bat populations that may arise due to construction is the loss of roost sites. However, no roosts were identified on the site during survey, and the nearest potential roosting location is 450 m away from the nearest turbine. Therefore, this impact will not arise at the Proposed Development. The magnitude of construction activities on bats is likely to be **neutral**, and the significance of the impacts will be **neutral**.

Otter

7.122 Impacts of construction works on otters includes damage to holts, disturbance at holts, disruption of dispersion and foraging routes and displacement of foraging or breeding animals. Disturbance of otters is possible during the construction phase, but the shy species is likely to avoid areas of intense human activity, particularly when this involves significant noise. Potential indirect impacts include adverse effects on fish prey species (see **Chapter 9** – Fisheries Assessment). The species is largely crepuscular in its habits, and it is likely that much of its activity will take place outside normal working hours. However, the reaction of individual otters to disturbance is unpredictable, with some inquisitive animals drawn to investigate work sites, whilst others avoid them. The likely sporadic nature of any use by otters of the site, indicates that there is highly unlikely to be any significant impact on the species as a result of construction activities. Magnitude of impacts is likely to be **negligible to neutral** and of **neutral** significance.

[9] Natural England Technical Information Note TIN051 Third edition February 2014, Bats and onshore wind turbines Interim guidance.

Badger

7.123 Potential conflicts with badgers (arising from construction) include damage to setts, disturbance at setts, and removal of foraging areas and displacement of foraging or breeding animals. Construction works may present additional hazards to badgers, with a potential for entrapment within excavations, accidental injuries on construction plant or materials, diversion from traditional trails by plant and site compounds and exposure to oils and other toxic materials.

7.124 There are numerous of badger setts located within the site and thus there is the potential for such disturbance to occur. Badgers have crepuscular and nocturnal foraging habits, and it is unlikely that daytime construction activities will disturb or reduce the foraging range of the local social group. However, construction of access tracks, crane bases, foundations and erection of turbines will reduce the area available for foraging.

7.125 There is also the potential risk of displacement of sensitive animals unaccustomed to high levels of anthropogenic activities. The potential magnitude of impact (without mitigation) on badgers during the construction phase is moderate adverse magnitude and significance.

7.126 However, the location of known badger setts has been identified and taken into consideration during the emplacement of site infrastructure such that there are no sett entrances within 25m of any infrastructure. In addition, the majority of setts near to areas of infrastructure are close to existing tracks and any disturbance impact is likely to be ameliorated by this fact. As a result of this mitigation measure, the potential impacts are of **minor adverse magnitude** and **minor significance** during construction.

Common Lizard

7.127 Construction of infrastructure will remove habitat for this species and cause disturbance leading to displacement of animals over a limited area of the site. It also has the potential to impact the habitat feature/requirements that lizards need within suitable habitat; this includes areas for basking, foraging, diurnal shelter and hibernation. The recorded use of the site by this species indicates that these impacts have the potential to be of **moderate adverse magnitude** and of **moderate adverse significance**. Therefore, mitigation is required (see paragraphs 7.177 – 7.186).

Operational Phase

7.128 Characteristics of wind farms that may generate impacts on the natural environment in the vicinity of the proposed scheme include:

- Replacement of former semi-natural habitats by turbines and associated infrastructure;
- Use of a swept volume of air space by turbine rotors;
- Vehicular use of access routes; and
- Improved access to remote sites.

7.129 Many of the impacts on biological receptors noted for the construction phase are also relevant during the operational phase. However, effective land take is reduced following the construction phase, as temporary site compounds and vehicle and plant running surfaces are returned to their former vegetation cover, and disturbance pressures arising from human presence along the route are significantly reduced.

7.130 Impacts on valued ecological receptors are outlined below.

Bats

7.131 The main potential impacts on bats during the operational phase arise from collision with rotors and from 'barotrauma', the often-fatal injuries that occur as a result of bats flying through air of rapidly changing atmospheric pressure in the immediate vicinity of a moving blade. The turbines have been located away from the habitat features that many species of bat use as flightlines or as a focus for foraging.

7.132 There is potential for loss of foraging area because bats may avoid a turbine site. Alternatively, there is some evidence that bats may be attracted to turbines (Kunz et al 2007[10]), possibly because insects may congregate in these locations as a response to the heat radiating from the structures (Ahlén 2003[11]). This effect is most likely to occur in calm conditions, or at low wind speeds, when collision risk for bats is likely to be at its highest.

7.133 A further possible operational impact is that ultrasound emissions from turbines may interfere with bats' echolocation capabilities. The literature addressing this effect is sparse and it is likely that impacts on Irish bat species is limited (European Commission 2010[12)]. **Table 7.9** outlines the bats likely to be at risk from wind turbines.

7.134 Seasonal variation in impacts of operational turbines on bats in Ireland is at present not fully understood. Movement of bats over long distances within a limited time period may produce a concentration of animals that are available for collision. Studies have shown that there is a peak in mortality in late summer and autumn during dispersal and migration, and that migrating species are most susceptible (Rodrigues et al 2008[13]). However, it is not known to what extent Irish bats migrate, which species, if any, are involved, whether migration is on a broad or narrow front, and whether there are discernible migration routes. It has been suggested that collisions during migration may be exacerbated because echolocation is not used in order to save energy (Keeley et al 2001[14]).

[10] Kunz, T.K., Arnett, E.B., Erickson, W.P., Alexander, A.R.H., Johnson, G.D., Larkin, R.P., Strickland, M.D., Thresher, R.W. & Tuttle, M.D. (2007) Ecological impacts of wind energy development on bats: questions, research, needs and hypotheses. – Frontiers in Ecology and the Environment 5: 315-324.R.

[11] Ahlén, I. (2003) Wind turbines and bats – a pilot study. – Report to the Swedish National Energy Administration, Dnr 5210P-2002-00473, P-nr P20272-1.R.

[12] European Commission (2010) Guidance on wind energy development in accordance with the EU nature legislation. European Commission, Brussels.

[13] Rodrigues, L., Bach, L., Duborg-Savage, M-J., Goodwin, J. & Harbusch, C. (2008) Guidelines for consideration of bats in wind farm projects. – EUROBATS Conservation Series No. 3, UNEP/EUROBATS Secretariat, Bonn.

[14] Keeley, B., Uogretz, S. & Strickland, D. (2001) Bat ecology and wind turbine considerations. –pp135-141 in Schwartz, S.S. (2001, ed) Proceeding of the National Avian-Wind Power Planning Meeting IV, Carmel, CA, May 16-17, 2000.

7.135 Late summer and autumn are also the period during which there may be increased activity associated with finding mates, and differentiating between migration and mating-related causality of mortality at turbines is problematic (Cryan and Barclay 2009[15]). Recent research into Leisler's bat in Ireland (Boston, 2008[16]) showed that this species does not migrate long distances between summer ranges and hibernation sites. Leisler's have been shown to hibernate within Ireland and do not appear to migrate in numbers on a broad front. This is likely to significantly reduce the collision risk for this species in the Irish context. However, in the absence of definitive data for all species, it is not possible to assess the likelihood, and hence the significance, of collision risk during putative migration periods. **Table 7.9** outlines the risk of collision fatalities affecting bat populations identified from the site.

Table 7.9: Level of potential vulnerability of populations of N. Irish bat species[17]

Relative abundance		Low collision risk	Medium collision risk	High collision risk
	Common species			Common pipistrelle Soprano pipistrelle
	Rarer species	Brown long-eared bat Daubenton's bat		Nathusius' pipistrelle Leisler's Bat
	Rarest species	Whiskered bat Natterer's bat		

7.136 In the absence of mitigation, bats flying along the site would be potentially in close proximity to the rotor swept areas during foraging and commuting activity (in summer). This could potentially result in bat fatalities. Therefore, under the precautionary principle (and without mitigation) this project has the potential to have a **moderate adverse** impact magnitude, of **major adverse** significance during the operational phase. As a result, detailed mitigation by design has been developed and implemented. In addition to the layout design, a detailed BMMP has been recommended. (Activity levels were however, low during spring and autumn).

7.137 With mitigation, and based on currently available data on all species of (Irish) bat species, the impact magnitude can be reduced to **neutral** significance during the operational phase of the Proposed Development.

Otter

7.138 The level of potential disturbance to otters is less during wind farm operation as compared with the construction phase, as the site reverts to minimal human

[15] Cryan, P.M. and Barclay, R.M.R. (2009) Causes of bat fatalities at wind turbines: hypotheses and predictions. Journal of Mammalogy, 90(6):1330–1340.

[16] Boston (2008) Molecular ecology and conservation genetics of the Leisler's bat (*Nyctalus leisleri*) in Ireland. Unpublished Ph.D Thesis.

[17] There is no Ireland specific section with the SNH guidance, therefore the Table 2 ('Scotland') has been adapted for use here (with Brandt's and Noctule bats removed) as this is the closest match to the bat species assemblage found locally to the Site.

presence. There is likely to be **neutral** impact magnitude and significance during the operational phase.

Badger

7.139 The use of access tracks will be mainly limited to single-vehicle journeys for maintenance and there will be minimal collision risk to badgers. There will be no additional impacts on badgers as a result of the operation of the Proposed Development. There is likely to be **neutral** impact on magnitude and significance during the operational phase.

Common Lizard

7.140 The use of access tracks will be mainly limited to single-vehicle journeys for maintenance, and there will be minimal traffic risk to lizards. The additional likely impacts on this species as a result of the operation of the Proposed Development will include species specific habitat management and enhancement measures. Overall, the successful implementation of these measures during the operational lifetime of the wind farm is likely to be of **minor positive** magnitude and of **beneficial** significance.

Decommissioning Phase

7.141 Impacts associated with decommissioning a wind farm bear many similarities to those arising during construction. Many of the work processes are similar and plant and vehicle movements are likely to be at a similar scale. It is assumed that decommissioning will require the removal of all above ground structures; the removal of all underground structures to one metre below ground level; and reinstatement of disturbed areas.

Species of Conservation Concern

7.142 Impacts on protected mammals and reptiles during decommissioning are likely to be of a similar scale and nature to those that occurred during construction and are unlikely to be significant.

7.143 Each of these impacts is described and assessed below and the unmitigated impacts, mitigation measures and residual impacts are summarised in tabular form (**Tables 7.10 & 7.12**).

Table 7.10: Significant Effects upon Valued Ecological Receptors (Prior to Mitigation)

Impact	Nature of Effect	Magnitude	Significance
Construction			
Bats	Disturbance of European Protected Species during construction activities	Neutral	Neutral
Otter	Temporary disturbance from construction works unlikely	Negligible	Neutral
Badger	Temporary disturbance from construction works probable	Minor	Minor Adverse

Impact	Nature of Effect	Magnitude	Significance
Common lizard	Temporary disturbance from construction works and loss of habitat	Moderate	Moderate Adverse
Operational			
Bats	Potential collision of European Protected Species with turbine blades (or barotrauma) during the operational phase	Moderate adverse	Major Adverse
Otter	Operational effects unlikely	Negligible to Neutral	Neutral
Badger	Operational effects unlikely	Negligible to Neutral	Neutral
Common lizard	Loss of habitat for the operational lifetime of the wind farm	Negligible to Neutral	Neutral
Decommissioning			
Bats	Disturbance of European Protected Species during decommissioning activities unlikely	Neutral	Neutral
Otter	Temporary disturbance from construction works unlikely	Negligible	Neutral
Badger	Temporary disturbance from decommissioning works possible	Minor	Minor Adverse
Common lizard	Temporary disturbance from decommissioning works unlikely	Neutral	Negligible

Design Evolution & Mitigation

7.144 The purpose of what is broadly classed as mitigation is to maintain the conservation value of a development site as far as is possible, and to exploit opportunities to enhance the site's conservation value wherever possible. This can be achieved by (CIEEM 2022):

- avoiding negative ecological impacts - especially those that could be significant;
- reducing negative impacts that cannot be avoided; and
- compensating for any remaining significant negative ecological impacts.

7.145 The aims of mitigation can be best achieved by choosing locations that allow sites or features of conservation value to be avoided; **Chapter 3: Design Evolution & Alternatives** provides a full description of the design evolution process which includes details on avoidance measures, including buffers to potential bat habitat features and badger setts.

7.146 Avoidance and impact reduction techniques relate to reducing the footprint of the development and any ancillary works as far as is practicable. Measures required to address ecological concerns described in this ES during the construction phase will be implemented by an Ecological Clerk of Works (ECoW) and contained in a Construction Environmental Management Plan (CEMP), which will be submitted to and agreed with the planning authority at the pre-construction stage. Avoidance and impact reduction measures include:

- No turbine rotors are within 50m from the edge flight-lines such as streams, which is the minimum stand-off distance from blade tip to the nearest habitat feature likely to be used by bats, (Natural England 2014). These buffers are

built into the layout of the Proposed Development as described in Chapter 3: Design Evolution & Alternatives.

- Consideration will be given to the provenance of fill materials for roads, in terms of the similarity of their physicochemical properties (particularly pH) to the present substrate.
- The contractor will prepare a CEMP prior to construction activities to provide a method statement for working practices that will include measures, among others, to prevent adverse impacts on rivers and other watercourses. Please also refer to the SUDS design Statement in Technical Appendix 10.1.
- A "no access" buffer will be implemented along sensitive watercourses to prevent damage to banks and to prevent disturbance of riparian habitats, apart from the narrow corridor required during construction.
- Access of all machinery and personnel will be limited to the working area corridor.
- Site compounds and stores will be sited away from any features of conservation interest, including watercourses. Any of these features in close proximity to the works or to compounds will be fenced to prevent damage by plant or stored materials.
- Dust suppression filters and appropriate wetting of running and work surfaces will be used to prevent masking of vegetation outside construction corridors, where appropriate.
- Appropriate speed limits will be imposed to reduce the potential for dust production.
- Excavations left unattended overnight should be ramped in at least one location to allow mammals to avoid becoming trapped.
- It is also recommended that, to minimise the risk of suspended sediment entrainment in surface water run-off, the site drainage system should only be carried out during periods of low rainfall and therefore minimum run-off rates.

7.147 Of particular importance for the maintenance of habitats and associated fauna is the institution of good management practices that prevent the discharge of silt and pollutants into the local drainage system. Containment measures will include:

- Where works near or in watercourses are unavoidable, working practices will include standard methods designed to minimise sedimentation and pollution, and measures will be put in place before the works begin to ensure containment of any released sediments. These may include silt containment booms or sediment barriers, as appropriate. Land stripping will be done in stages to minimise the potential for concentrated, long-lasting pulses of silt to discharge into watercourses. All filtration systems will be monitored frequently, and they will be replaced before they become ineffective.
- Material storage compounds will be located remote from any watercourse. Surface water run-off high in suspended solids should be contained and treated prior to discharge to any watercourse. All storage tanks should be bunded and

should be sited remotely from any watercourse. Works should incorporate the relevant Pollution Prevention Guidelines. Additionally, a Pollution Incident Response Plan should be put in place as part of the Construction Environmental Management Plan.

- Water should be pumped from turbine bases during construction either to areas of ground capable of absorbing the water or to settlement ponds prior to discharge. Any discharged water must be free of cementitious products.
- All tracks and drains will be maintained and monitored to ensure that surface water flow is directed as designed, and that ponding and blockages are prevented.

7.148 Further details about the proposed SuDS are included in **Technical Appendix 10.1**.

7.149 Avoiding or mitigating impacts arising from construction-initiated alterations of drainage patterns and infiltration regimes is of importance for preventing damage to both aquatic and terrestrial habitats. It must be appreciated that hydrological characteristics of peatland and the habitats that they support are inextricably linked, and that changes in hydrological regime will lead to changes in these habitats. The areas of blanket bog have been avoided by sensitive siting during the design process. The site hydrological regime is considered in detail in **Chapter 10: Geology & the Water Environment** and measures outlined there will be carried out in order to maintain the limited areas of conservation interest on the Site.

7.150 Sympathetic management of the wind farm habitats during the operational phase will provide the greatest opportunity for enhancing the conservation value of the site and should be regarded as compensatory mitigation for the permanent land take required for the new turbines and infrastructure.

7.151 The Outline Habitat Management Plan (Technical Appendix 6.2) includes compensation and enhancement measures for lizard achieved by a significant reduction in grazing pressure within the habitat management area (shown in **Figure 6.6**) for the lifetime of the Proposed Development.

Species specific mitigation

Mitigation for bats

7.152 Under the precautionary principle, and due to the presence of several species of bat known for open-air foraging, i.e. considered at risk from turbine associated mortality (Leisler's bat; common and soprano pipistrelle, a BMMP will be implemented as follows.

7.153 The BMMP will include the use of "feathering". This shall involve pitching the blades to 90 degrees and/or rotating the blades parallel to the wind direction to reduce the blade rotation speeds below two revolutions per minute while idling. This will substantially reduce the risk of bats being struck by idling blades and will reduce the spatial extent of low-pressure vortices in the wake of the blades (i.e. will substantially reduce the potential for barotrauma to occur).

7.154 This BMMP will consist of post-construction monitoring in the form of casualty searches, undertaken during years 1-3 post construction. These will be extended for a further two seasons in the event that activity levels (as recorded during the static monitoring) are moderate/high (>50 bat passes at the turbine during a single night) or if a bat carcass is found.

7.155 Carcass searches will be conducted during the summer (15 Jun – 15 Aug) season only, as bat activity levels have been identified as low during spring and autumn. This monitoring will entail the systematic search for bat casualties within a 150m x 150m grid centred on the turbine. Searches will commence in June and be carried out as shown in Table 7.11 (adjusted accordingly depending on weather conditions; see below). They will begin no later than 1-hour post-sunrise to minimise the potential for carcass removal by predators. Three turbines will be searched during each visit, and these will be selected at random across the year.

Frequency of searches and number of turbines to be searched

7.156 Searches will be conducted at 2 to 4-day intervals (SNH 2019). Data must be obtained from the turbine operators on whether or not the target turbine was operational on the night preceding the search, with the surveying protocol being adjusted as necessary if the turbines were either non-operational or were not rotating because of a lack of wind.

7.157 To maximise the duration of monitoring during each season, whilst maintaining low carcass removal rates, it is recommended that surveying should be split into blocks as illustrated below. This is the spring schedule, which will be repeated during summer and autumn.

Table 7.11: Summary of proposed schedule for carcasses searches (spring).

Days 1-10	Days 11-20	Days 21-30	Days 31-40	Days 41-50	Days 51-60
Initial 'sweep' then survey alternate days (d2, d4, d6, d8, d10)	No Survey	Initial 'sweep' then survey alternate days	No survey	Initial 'sweep' then survey alternate days	No survey

Bat Carcass (Mortality) Searches

7.158 Bat carcass searches will be undertaken using a specialist ECoW; and will only take place the morning after optimal conditions for bats have occurred. These are defined as;

- <5m/s ground wind speed,
- >10^{o}C of temperature (1 hour after dusk),
- no rain, and
- after a warm day of similar settled conditions (i.e. the dusk should have a peak in bat activity in the area).

7.159 Carcass searches will commence one hour after dawn to minimise the potential for carcass removal by predators.

7.160 This approach has been selected to maximise the likelihood of finding bat carcasses, which is essential in enabling predicted bat mortality to be accurately estimated. Bat carcasses (if found) will be collected to enable accurate species identification using DNA where required. A post-mortem will also be conducted in order to ascertain the cause of death.

7.161 Also, the recording of a bat activity across the application site will also take place using automated detectors at the turbine base paired with adjacent habitat features. The recording will be undertaken for 10-nights during Spring, Summer & Autumn. This will also allow for comparison with the date collected previously as part of the planning application.

Meteorological Data

7.162 Simultaneous daily collection of meteorological data including wind speed, temperature, and precipitation will be undertaken at the turbine location, alongside bat carcass searches to identify the effect on levels of bat activity at the turbine(s).

Operational curtailment

7.163 In the event that >1 dead bat is found (in any season) during carcass searches, curtailment of the turbine will be immediately implemented on a precautionary basis. This will involve increasing the cut-in speed to 5 m/s, which is recommended by Mathews et al (2016). As bats are nocturnal, the increased cut-in speed will only apply at night, measured from 30 minutes before sunset to 30 minutes after sunrise. The increased cut-in speed will only apply between the 15 Apr and the 15 Oct each year (i.e., the generally accepted bat activity season in NI). For the remainder of the year (i.e., 15 Oct to 15 Apr), the turbine manufacturer's cut-in speed will be used.

Search efficiency trials

7.164 In addition to the proposed operational curtailment, the efficiency of the search dogs will be assessed based on integrated efficiency trials (Mathews et al., 2016). Use of this method will allow a correction factor for search efficiency to be factored into statistical modelling of numbers of bats which may be found dead beneath the turbine.

7.165 Carcasses will be dropped from waist height at randomly selected points within the search area under the turbine, on days when the dog teams are conducting searches and prior to searches taking place. The person placing the bats will not be involved in the search and will not reveal the exact number and location of bats that have been deployed to the dog teams until the trial is concluded.

7.166 When conducting observer efficiency trials for dog search teams, care will be taken to avoid transferring human scent to the specimen, for example by using tongs or disposable gloves. To allow human scent from footprints to dissipate, an interval of

at least an hour will be left between placing the bats and conducting the searcher efficiency trial.

Scavenger removal rates

7.167 In order to determine the rate at which carcasses are removed (and therefore not be available for dogs to find), scavenger removal trials will be completed.

7.168 A carcass (of similar size and colour to a bat) will be left under the turbine each season. The carcasses will be placed out around dusk, and transference of human smell will be avoided. Carcasses will not be left under the turbine if and when searches are being carried out.

7.169 The carcasses will be monitored through the use of a motion-activated remotely operated camera for up to 10 days (battery life is affected by weather and the number of times the camera is triggered and is not entirely predictable). A second visit will be made to the site to check the cameras and change the batteries to ensure we can assess the scavenging rates over a three-week period. Assessing rates over a shorter timeframe would not enable a true test of scavenging removal rates to be made (Mathews et al., 2016). Different habitat types will be selected for the trials to ensure a robust evaluation of scavenging rates can be made.

7.170 The methods used in the Matthews (2016) study involved daily visits, rather than camera traps, to check corpses for the first seven days, but the use of camera traps will be more resource efficient and should also indicate the time at which the corpse was taken as well as the species of scavenger in most cases.

7.171 Different locations will be selected for the carcasses during each visit so that scavengers do not become familiar with feeding locations, and the cameras will be repositioned accordingly.

Estimating actual mortality rates

7.172 The number of observed bat carcasses recorded during the study will be corrected taking into account the area searched, scavenger rates and searcher efficiency results. Various researchers have proposed different approaches to data correction including Korner-Nievergelt et al. (2011), Korner-Nievergelt, et al. (2011), Bispo et al. (2012), and Lintott et al. (2016).

7.173 The most up to date formula for estimating the total number of carcasses present per turbine per season will be applied to the data collected at the end of the survey season

Remedial measures

7.174 The trigger threshold for remedial measures will be linked to ‘significance’ in line with the CIEEM guidelines for EcIA. Remedial measures will be triggered by an impact predicted to be of significance to bats at the Local level or greater.

7.175 For geographic context, the local level is considered to represent the site boundary plus a 15km radius. A significant effect would be triggered where the level of bat

mortality is considered to reduce the ability of the bat population at the Local scale to sustain a viable and stable population, as informed by monitoring.

7.176 The requirement for and design of remedial measures will depend upon the findings and conclusions of monitoring and specific measures will be developed as appropriate to mitigate and significant impact predicted (those considered significant to bat populations at the Local scale or above). Where significant impacts are predicted, potential remedial options may include, but are not limited to, the feathering of individual turbines.

Mitigation for viviparous lizard

7.177 In the case of common lizard, it has been impossible to totally avoid impacts to this species, given the layout constraints. Therefore, the next course of action is to mitigate for any potential impacts.

7.178 The results of the common lizard surveys for the Proposed Development were assessed against the Key Reptile Site Survey Assessment Categories (HGBI 1998). This revealed that parts of the site had a good population (with ten individuals recorded). However, given the location of the records, it is also likely that much of the site is sub-optimal habitat for this species. This is likely a consequence of over-grazing.

7.179 Depending on the commencement of construction on site, the works corridor will be mowed. If possible, this work will be undertaken before the end February (to avoid a conflict with the bird breeding season). If this is not possible, then mowing will take place between August and September, when common lizards are likely to be fully active. Should the latter be required, the corridor will be subjected to an active nest survey by a suitably qualified ornithologist immediately prior to the commencement of mowing operations.

7.180 Clearance of stones, tree stumps, logs, brash, rocks or piles of similar debris will be undertaken carefully and by hand. Although this is only required in a few areas where the proposed site tracks traverse low stone walls. This work will not take place during the hibernation period for common lizard (i.e., mid-October to mid-March).

7.181 Clearance of tall vegetation will be undertaken using a strimmer or brush cutter with all cuttings raked and removed the same day. Cutting will only be undertaken in a phased way which will either include:

- Cutting vegetation to a height of no less than 30mm, clearing no more than one third of the site in anyone day or;
- Cutting vegetation over three consecutive days to a height of no less than 150mm at the first cut, 75mm at the second cut and 30mm at the third cut;

7.182 Following removal of tall vegetation using the methods outlined above, the remaining vegetation will be maintained at a height of 30mm through regular mowing or strimming to discourage common lizards from returning. Ground clearance of any remaining low vegetation (if required) and any ground works will only be undertaken following the works described above.

7.183 As an additional precaution the ECoW will be present from the commencement of clearance/construction with a watching brief to ensure that no common lizards remain within the construction corridor and remain in situ until the area is cleared to ensure no species or habitat conflicts emerge affecting damage to the local lizard population.

7.184 If any common lizards are found during excavation works, all works within the affected area will cease until the ECoW has safely removed them (under licence) from the construction corridor.

7.185 Should it prove necessary during site supervision (i.e., lizards are observed returning to the construction corridor); a protective lizard barrier fence will be installed along both sides of the construction corridor in order to prevent common lizards from entering the works area.

7.186 In total, there is >500 ha (of blanket bog; dry heath and marshy grassland) adjacent to the proposed construction corridor. These areas together provide more than sufficient suitable habitat.

Residual Impacts

7.187 Residual effects relating to land management that is designed to provide ecological benefits through the establishment of grazing measures which are appropriate within peatland and associated habitats (See **Technical Appendix 6.2** – outline Habitat Management Plan) will result in more diverse and ecologically valuable habitat than the present degraded habitats that cover the majority of the site. Continuity of effective, appropriate management should result in the area becoming more biodiverse over time. With improved land management, it is anticipated that in the long term there will be at least a neutral residual impact on fauna of conservation concern. For habitats, a beneficial impact is likely if site management results in more diverse habitats of greater conservation value

7.188 **Table 7.12** provides details of the residual impacts.

Table 7.12: Summary of Residual Impacts after Mitigation and Enhancement

Impact	Ecological Impact Significance without Mitigation	Mitigation & Enhancement	Ecological Impact Significance with Mitigation
Construction			
Temporary disturbance to bats	Neutral	No mitigation required	Neutral
Temporary disturbance to badgers	Minor	A 25m buffer has been applied to all badger setts found within 25m of the construction area. In addition, a pre-construction badger survey will be completed.	Neutral

Impact	Ecological Impact Significance without Mitigation	Mitigation & Enhancement	Ecological Impact Significance with Mitigation
Temporary disturbance to common lizard	Moderate	Implementation of species-specific mitigation to off-set potential significant effects including phased mowing of the vegetation within the construction corridor.	Negligible to Neutral
Operational			
Potential collision of bats with turbine blades	Major adverse	The proposed turbine layout was designed to ensure a minimum stand-off distance of 50 m (Natural England TIN051) to all habitat edges (shelterbelts and natural watercourses) which will be maintained through the lifetime of the Proposed Development. A Bat Monitoring & Mitigation Plan (BMMP) will be implemented under the Precautionary Principle.	Neutral
Disturbance to badgers	Neutral	None required, no badger setts found within 25m of the construction area.	Neutral
Disturbance to common lizard	Neutral	Implementation of species-specific enhancement to off-set potential significant effects includes; Management of 80.25 hectares of habitat which will also benefit this species.	Beneficial
Decommissioning			
Temporary disturbance to bats	Neutral	No mitigation required	Neutral
Temporary disturbance to badgers	Minor	None required, no badger setts found within 25m of the construction area.	Neutral
Temporary disturbance to common lizard	Negligible	No mitigation required as no impact during the decommissioning phase is considered likely.	Neutral

Cumulative Impacts

7.189 When considered in the context of the overwhelming dominance of the impact of agricultural land-use change as the primary driver controlling the extent and quality of habitats in Northern Ireland, as well as natural variation (in species populations) over time, it is credible to assume that in only very exceptional circumstances will direct effects in aggregation between wind farm sites have any potential to be cumulatively of concern let alone significant (in EIA terms). It is not unreasonable to assume that any such aggregate effects that may be of significance are likely to be readily apparent to those considering individual applications who can inform consideration of specific detailed measures to avoid unacceptable effects[18].

7.190 The potential for a cumulative impact between proposed and operational wind farms arises principally if species from the same population are using more than one of the

[18] Review of Guidance on the Assessment of Cumulative Impacts of Onshore Windfarms, Phase 1 Report, ENTEC, September 2008

sites. The likelihood of this can be assessed through an analysis of the species assemblage and by examining the likely range and territory size of those species.

7.191 The area over which a cumulative impact may be felt should also be considered, and in the present case, wind farms within a radius of 15km have been identified. However, Ballykeel (under construction) and Carnalbanagh (proposed) are considered to be the only wind farms likely to have the potential to have a significant cumulative effect.

7.192 The following sections assess the potential cumulative impacts, as a result of the Proposed Development with other proposed and operational wind farms, where relevant.

Bats

7.193 Outcomes which must be considered are whether the cumulative impact of wind farm developments will adversely affect the distribution of these species of European conservation concern, and whether there will be population-scale effects on any bat species. The most contentious species issue currently is the extent to which bats may be at risk of collision with turbines. There is potential for bats to forage across more than one wind farm and to be subject to at least the potential of an increased risk of collision. As yet there is no agreement on how best to address it, though specific impacts on bats have been addressed through the incorporation of precautionary stand-offs to habitat features (foraging and commuting areas), as well as the selection of windfarm sites with 'low' levels of bat activity.

7.194 The development therefore has the potential to increase bat mortality resulting from collision and barotrauma, and this impact is likely to be additive to similar impacts arising from the operation of other wind farms, at both local and regional scales. The absence of data relating to bat life cycles and to the intensity and spatial variation of activities during different parts of those life cycles means that there is difficulty in determining the significance of the cumulative impacts on bat species. It is likely that the significance of cumulative impacts will also vary between species, depending on inter alia local and regional abundance of different species, prey preferences, preferred flight height, preferred foraging habitat, degree of attraction to or deflection from turbines, extent of migratory behaviour, swarming characteristics and variability of behaviour in response to varying weather conditions. Bat behaviour and collision risk are likely to be highly site-specific during much of the annual cycle, but more generalised patterns, such as those relating to migration, may be superimposed on these local factors.

7.195 Whilst evidence is beginning to be revealed through a combination of academic research and on-going monitoring at wind farm sites, certainty with regard to cumulative effects is far from clear. This is because the effects of wind farms on bat populations is dependent on a wide variety of factors including; the turbine layout, the species of bats present, existing environmental conditions and the mitigation measures proposed at each wind farm (or individual turbine). Therefore, a clear

understanding of the patterns of bat activity at individual wind farms (during the development of EIA's) is essential.

7.196 In the case of the Proposed Development a clear understanding of the patterns of bat activity at the site and surrounding area was used to inform the final layout and recommend mitigation, in the form of precautionary stand-off distances to habitat features, and the maintenance of said buffers for the 35-year lifetime of the wind farm). The resulting residual impact, following mitigation, is neutral.

7.197 The potential cumulative impact of the Proposed Development in addition to wind farms (within 15km) was specifically considered in relation to bats. These included three operational wind farms (two have 10 and one has 9 turbines) and one consented wind farm ((planning consent has been granted for Corkey Repower (5 turbines) to replace the operational Corkey Wind Farm (10 turbines). These are;

- Gruig Wind Farm (immediately adjacent to site);
- Corkey (1 km north);
- Corkey Repowering (to replace the operational Corkey Wind Farm) (1 km north); and
- Altaveedan (6.5 km north).

7.198 This gives a maximum total of 29 turbines located within the study area for cumulative effects in addition to the Proposed Development.

7.199 The stand-off distances of the existing turbines were measured (in addition to the 12 turbines in the Proposed Development), in relation to habitat features such as watercourses and plantation edges (areas which are known to have higher levels of bat activity). None of the approved turbines encroached on the Natural England stand-off distance to the edge habitat features. Therefore, if precautionary stand-off distances were applied retrospectively to the wind farms described, the layouts would comply with the guidance (with the implementation of agreed mitigation at the respective sites listed above). The cumulative impact (of the 12 proposed Carnbuck turbines) is not considered to alter the existing predicted impacts, therefore the cumulative impact is **not** considered to be **significant**.

Badger

7.200 It is not anticipated that the Proposed Development will have a measurable impact on local badger social groups and the wind farm will therefore not contribute to any cumulative impacts that may be detectable from the operation of other wind farms in the local area. The cumulative impact on badgers is considered to be **not significant**.

Reptiles

7.201 The limited distribution of these species across much of the site and the habitat improvements specifically designed to favour them, indicate that the Proposed Development will not add to any adverse cumulative effects that may arise from wind

farm developments generally. The cumulative impact on the site herpetofauna is therefore considered to be **not significant**.

Trans-boundary effects

7.202 Potential trans-boundary effects of the Proposed Development on designated sites and on mobile species (i.e., bats) were assessed. The effects are considered to be the same as those described in the relevant sections (i.e., cumulative effects). Trans-boundary effects are therefore not considered to be significant.

Conclusions

7.203 There is no regular usage of the area by smooth newt or marsh fritillary butterfly, therefore no impacts to these species are likely. Otter only use the site for commuting and no holts were noted, therefore no impact is considered likely. Mitigation for the reptiles found on site (i.e., common lizard) is proposed. This involves the provision of habitat management, as well as drift fencing (if required) and mowing/hand clearance during the construction phase. All badger setts have been buffered by the required 25 m from any infrastructure.

7.204 The proposed outline HMP will ensure compensation for areas of NI Priority Habitat lost under the footprint of the Proposed Development and should also result in enhancement of the local site ecology.

7.205 The mitigation measures specified in **Table 7.12** will be adhered to, ensuring that any potential impacts to bats will be negligible. In conclusion and based on current knowledge this would appear to be a site posing little risk to bats or bat populations, however a BMMP has been recommended as a precaution.

7.206 Therefore, the potential effects of the Proposed Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a **negligible-neutral adverse, neutral or beneficial effect** that would not adversely affect the ecological integrity of the site and the wider area.

7.207 An assessment of cumulative impacts on the habitats and fauna of the area was also undertaken, and it was concluded that this is **not significant impact**.

References

7.208 References have been inserted as footnotes within the body of the document.

Abbreviations

AONB	Area of Outstanding Natural Beauty
ARGUK	Amphibian and Reptile Groups of the UK

ASSI	Area of Special Scientific Interest
BSBI	Botanical Society of the British Isles
CEDaR	Centre for Environmental Data and Recording
CIEEM	Chartered Institute of Ecology and Environmental Management
CNCC	Council for Nature Conservation and the Countryside
EC	European Commission
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
HRA	Habitat Regulations Assessment
HSI	Habitat Suitability Index
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LHP	Larval Host Plant
LUAC	Land Under Applicant Control
MNR	Marine Nature Reserve
NBN	National Biodiversity Network
NIBG	Northern Ireland Bat Group
NIEA	Northern Ireland Environment Agency
NIPS	Northern Ireland Priority Species
NNR	National Nature Reserve
NR	Nature Reserve
PPS	Planning Policy Statement
SAC	Special Area of Conservation
SLNCI	Sites of Local Nature Conservation Importance
SPA	Special Protected Area
UW	Ulster Wildlife