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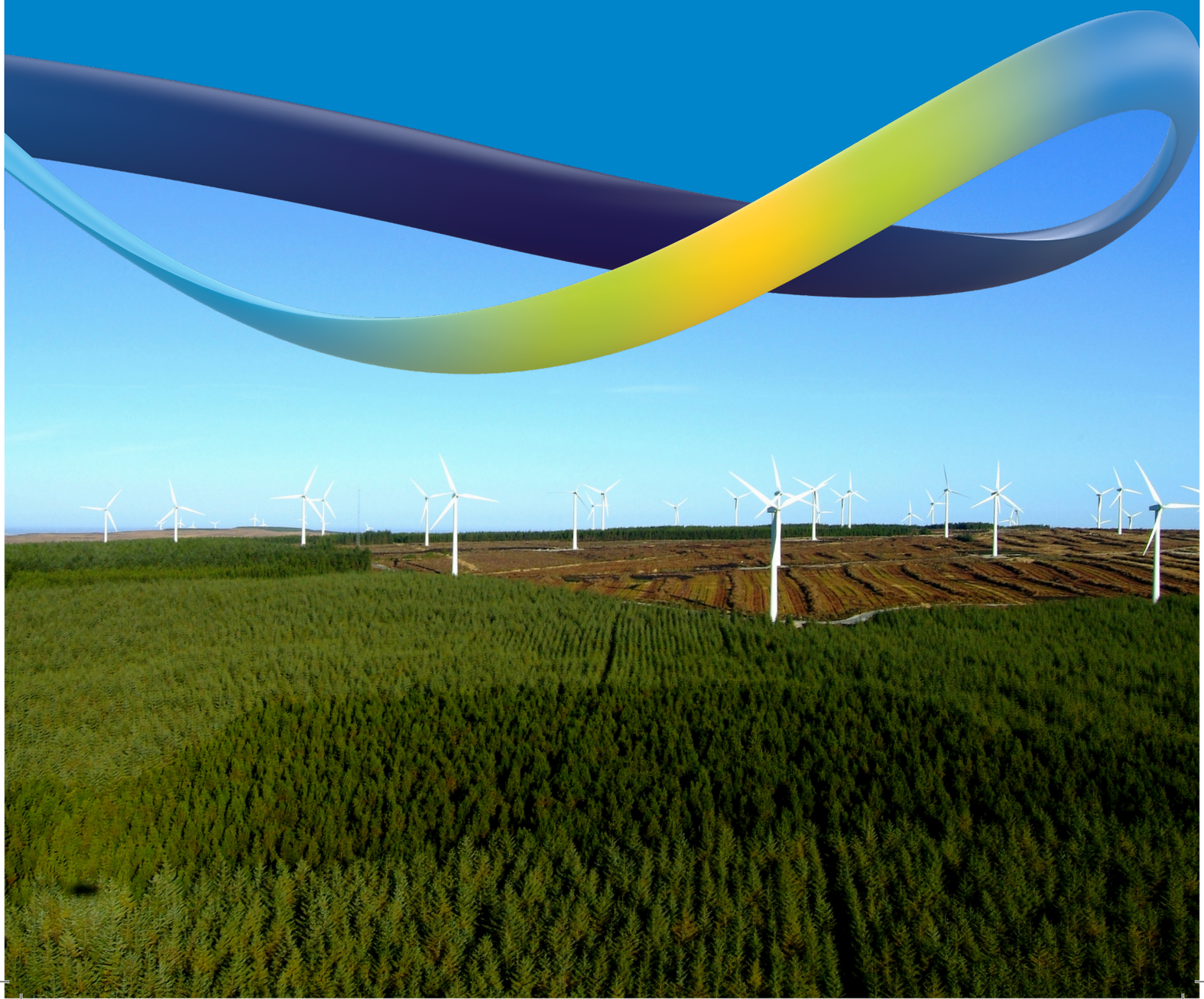
DERRYBRIEN WIND FARM PROJECT

Gort Windfarms Ltd.

Substitute Consent Application

Volume 2 Environmental Documents

Section 7 Article 12



Derrybrien Wind Farm

Consideration of Article 12 of Council Directive 92/43/EEC

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1 Introduction

Introduction

1.1 ESB (Dublin) is preparing a remedial Environmental Impact Assessment Report (rEIAR) for the Derrybrien Wind Farm. As a result of a European Court of Justice (ECJ) Judgment in 2008 and ECJ Opinion in 2019, Galway County Council issued a notice[1] requiring an application for substitute consent (accompanied by a rEIAR and rNIS) under Section 177B of the Planning and Development Act 2000 (as amended). The application will be required for the Wind Farm and associated works and this will need to be made to An Bórd Pleanála.

1.2 BSG Ecology was appointed by ESB (Dublin) on 29 April 2020 to undertake an assessment of the Derrybrien Wind Farm with reference to its potential impact on species listed in Annex IV of Council Directive 92/43/EEC of 21 May 1992 (specifically bats and otter *Lutra lutra*), having regard to Article 12 of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (referred to in this report as the 'Habitats Directive').

1.3 This document presents the results of an assessment that considers the requirements of Article 12 of the Habitats Directive with specific reference to bat species and otter (no other Annex IV species are considered likely to be affected by the Wind Farm). It makes reference to the data that have been collected through a combination of desktop study and field survey, with surveys being completed over a number of years.

ECJ Judgment (2008) & ECJ Opinion (2019)

1.4 In 2008 the ECJ published a Judgment on Case C-215/06, which related to Ireland's failure to fulfil certain obligations arising from the Environmental Impact Assessment (EIA) Directive. The Judgment considered the Derrybrien Wind Farm as an example of this failure. In particular the Judgment found that Ireland had failed to ensure that an environmental impact assessment had been completed for developments such as Derrybrien Wind Farm prior to development consent being granted.

1.5 In June 2019 the ECJ published an Opinion for Case C-261/18 in relation to the failure of Ireland to comply with the Derrybrien Wind Farm aspects of the original 2008 ECJ Judgment (Case C-215/06). A rEIAR (see paragraph 1.1) and this Article 12 assessment have been prepared in response to the ECJ Judgment and Opinion.

Project Overview

1.6 Derrybrien Wind Farm, which is located in the south of County Galway in the Slieve Aughty Mountains, comprises 70 Vestas V52-850 kW wind turbines (with hub height 49 m and blade length 26 m), a substation and a grid connection comprising a 7.8 km overhead line and substation at the National Grid connection point. The Wind Farm is located within the Slieve Aughty Mountains Special Protection Area (SPA).

1.7 Construction on the Wind Farm commenced in June 2003 and by October of that year approximately 50% of wind turbine bases had been completed. At this time a large peat slide occurred, which originated within the wind farm site boundary.

[1] Part XA of the Planning and Development Act 2000 (PDA 2000) (as amended) relates to Substitute Consent. Specifically, Section 177B (1) of Part XA of the PDA 2000 (as amended) requires that where a planning permission for a project requiring an environmental impact assessment has been found defective in a material respect by a court of competent jurisdiction in the State or the European Court of Justice, the planning authority must give notice in writing to the developer or other appropriate person directing that the person concerned apply to the Board for substitute consent no later than 12 weeks from the date of the notice and that the substitute consent application is to be accompanied by a remedial Environmental Impact Assessment Report (rEIAR) or remedial Natura Impact Statement (rNIS) or both as the case may be.

1.8 In response to the peat slide boulder barrages were installed at the point of the peat slide and within the subsequent failure flow downstream. The purpose of the barrages was to minimise the effects of the slide on adjacent land and receiving watercourses. Further remedial works were undertaken between 2004 and the end of 2005.

1.9 Following the peat slide, construction work was halted for almost a year to allow ground stability to be investigated. Construction work on the Wind Farm then recommenced and was largely complete at the end of 2005. The Derrybrien Wind Farm was then commissioned between September 2005 and March 2006, and commenced commercial operation in March 2006. The Wind Farm has been in continuous operation since then with a projected operational life until about 2040.

Site Description

1.10 The Wind Farm was constructed on land that was primarily used for commercial forestry (conifer plantation) that had been established on upland blanket bog. The conifer plantation comprised single species stands of Sitka spruce *Picea sitchensis* and lodgepole pine *Pinus contorta*. Information provided by Coillte shows that planting took place between 1963 and 1996. Mature stands were present in the western, northern, and central sections of the site: within the south central part of the site there are immature trees with heathland and bog vegetation persisting in the ground layer.

1.11 Conifer plantation also occurred along the entire length of the Overhead Line corridor, and the various stands also varied in age. Mature conifer plantation occurred in the footprint of the Agannygal Substation and the associated access route.

1.12 Cutover bog occurred throughout the eastern section of the Wind Farm with small remnants of intact blanket bog persisting in the centre of the site. The vegetation within the cutover bog area was dominated by purple moor-grass *Molinia caerulea* with an abundance of cotton-grass *Eriophorum* sp. in places. Few *Sphagnum* species were recorded within the cutover bog.

1.13 The layout of the Wind Farm avoided an area of intact blanket bog located in the central part of the site. A second area of intact blanket bog was recorded in the north-western part of the study area, just outside the Wind Farm site boundary.

1.14 A small dystrophic lake was present within the central part of the site. The layout of the Wind Farm avoided this small lake.

Author Experience

1.15 This report has been prepared by Steven Betts CEcol CEnv MCIEEM Associate Director at BSG Ecology. He has worked in fisheries, ecology and nature conservation since 1992 and joined BSG Ecology in 2004.

1.16 Steve has worked on a wide range of projects that include masterplans, infrastructure, renewable energy, housing, industrial and research projects. He has experience of preparing Ecological Impact Assessments and developing mitigation proposals. He has Public Inquiry experience preparing proofs of evidence and supporting statements for planning appeals, inquiries and Examinations in Public.

1.17 Steve has experience in a number of specialist areas including riverine and stillwater ecology, water quality, fisheries, habitat assessment and restoration and protected species. His work has regularly included the assessment of impacts on nationally and internationally designated wildlife sites, including the completion of Habitats Regulations Assessments. He has worked extensively with protected species, including badger, bats, otter, red squirrel, white-clawed crayfish and great crested newt. He holds protected species survey licences issued by Natural England and Scottish Natural Heritage for great crested newt and bats and he holds a conservation licence for white clawed crayfish in England. Steve has also held development licences for many of these species.

1.18 Steve has a thorough working knowledge of nature conservation legislation and policy, and its practical application, gained by working on projects in the UK and Ireland. He also has a good understanding of relevant European legislation including the Habitats Directive.

1.19 The report has been reviewed by Dr Roger Buisson CEnv MCIWEM Associate Director at BSG Ecology. Roger has a track record of over 30 years of assessing the impacts of human activities on wildlife populations and the habitats that support them. He has worked in a senior consultancy role since 2004, leading teams of ecologists delivering desk studies, species and habitat surveys and impact assessments for private and public sector clients.

1.20 Roger has considerable experience managing projects that have a significant element requiring impact assessment (EIA and HRA) or have the potential to go to Public Inquiry or Hearing. He provides scientifically robust advice and information on the sustainable development of projects, with a focus on nationally important infrastructure and the potential ornithological impacts of wind farms.

1.21 He has appeared as expert witness at Inquiries or Hearings related to renewable and conventional energy generation, transport infrastructure and housing development. His experience has resulted in him being contracted to carry out reviews of environmental statements and reports to inform appropriate assessments for Government and its agencies and to prepare such documents for public bodies acting as the appropriate authority or the decision making body.

2 European Legislation

Council Directive 92/43/EEC (Habitats Directive)

2.1 The Habitats Directive sets out measures the objective of which is the preservation, protection and improvement of the quality of the environment, including the conservation of natural habitats and of wild fauna and flora. Article 12 of the Habitats Directive sets out the strict protection that is afforded to certain species and directs Member States to implement the necessary measures to achieve this strict protection.

2.2 Article 12 states:

1. Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:

(a) all forms of deliberate capture or killing of specimens of these species in the wild;

(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration;

(c) deliberate destruction or taking of eggs from the wild;

(d) deterioration or destruction of breeding sites or resting places.

2. For these species, Member States shall prohibit the keeping, transport and sale or exchange, and offering for sale or exchange, of specimens taken from the wild, except for those taken legally before this Directive is implemented.

3. The prohibition referred to in paragraph 1 (a) and (b) and paragraph 2 shall apply to all stages of life of the animals to which this Article applies.

4. Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.

2.3 The elements of Article 12 that are considered relevant to Derrybrien Wind Farm are Article 12(1)(b) deliberate disturbance (bats and otter) and Article 12(4) in respect of incidental killing of Annex IV species (bats). No issues are considered to arise under any of the other sub-paragraphs of Article 12.

2.4 Various studies (e.g. Dürr & Bach, 2004; Dürr, 2019) have found evidence that operating wind farms can result in the death of bats, for example as a result of collision with moving blades or as a result of barotrauma caused by flying too close to moving blades. Consequently there is a need to establish whether or not an operating wind farm is having an impact on bats and, if so, to implement appropriate measures to mitigate those impacts.

2.5 The peat slide that occurred at the Wind Farm has impacted on habitats that may be used by otter for commuting, feeding or as a place of rest or shelter.

Interpretation of Article 12

2.6 In the following section reference has been made to relevant UK case law as the author is unaware of equivalent case law or related guidance from Ireland.

2.7 In the UK the Supreme Court's decision in the case of Vivienne Morge v Hampshire County Council [2010] EWCA Civ 608 (handed down on 19 January 2011) provides direction on the meaning of the Article 12(1)(b) Habitats Directive "deliberate disturbance" offence. The UK Supreme Court provided an assessment of what "deliberate" means:

"As stated by the Commission in para 33 of its Guidance (European Commission, 2007), ""deliberate" actions are to be understood as actions by a person who knows, in light of the relevant legislation that applies to the species involved, and the general information delivered to the public, that his action will most likely lead to an offence against the species but intends this offence or if not consciously accepts the foreseeable results of his action." Put more simply a deliberate disturbance is an intentional act knowing that it will or may have a particular consequence, namely disturbance of the relevant protected species."

2.8 If, based on professional judgement, an activity is considered unlikely to lead to the disturbance of an Annex IV species (such as bats), it follows that any unexpected disturbance is unlikely to have been "deliberate". In applying this to a completed development and any associated activities (such as an operating wind farm), if it becomes clear that an Annex IV species (such as bats or otter) is being killed or disturbed by the development then the operator may be considered to be deliberately killing or disturbing the species if the activity is allowed to continue (European Commission, 2007).

2.9 As stated by the Commission in para 82 of its Guidance (European Commission, 2007):

"Article 12(4) could be of relevance in defining the requirements of both a "strict protection system" and an "appropriate surveillance system". A system of strict protection can also make provision for recording the incidental capture and killing of species (for Article 12(4)). In this context, the strict protection measures may ultimately need to include conservation measures required to offset the negative impact of incidental capture and killing".

2.10 This indicates that a monitoring system will need to be put in place in situations where a development may result in the incidental killing of an Annex IV species. Measures will need to be implemented to offset impacts if evidence comes to light that incidental killing of Annex IV species is occurring. The Guidance (European Commission, 2007) notes that an example of a situation where this might apply is:

'the monitoring of bat deaths in wind turbines or roadkills'.

2.11 A High Court Judgment in 2012 has provided some clarity regarding the issue of 'deliberate' killing of birds and bats at windfarms (Eaton V. Natural England And RWE Npower Renewables Ltd [1012] EWHC2401). Whilst this case relates to the British judicial system, in the absence of an equivalent Judgment in Ireland it provides a useful reference point.

2.12 In determining this case the Judge considered in detail whether operating a wind farm where the likelihood of killing or injuring of birds and bats had been accepted, would constitute an offence under the Wildlife and Countryside Act 1981 or the Habitats Regulations 2010. The Environmental Statement (ES) for the scheme being considered had identified that there was a low risk to wildlife.

2.13 In the Judgment it is noted that Article 12(4) seems to indicate that the Habitats Directive accepts, in some circumstances, that there will be incidental capture, killing or injury of protected species that would not constitute an offence as envisaged under Article 12(1)(a). The Judge considered what this might mean in assessing the likelihood of an offence being committed in this case. He concluded that "*the expression 'incidental killing' cannot be confined to the case of a one-off accident*" where there would clearly not be an offence, and noted that the particular activities included under Article 12(1) would include those where "*killing may occur from time to time*". In other words there is a range, from a one-off accident that is clearly incidental killing, through to deliberate targeting of protected species, which would be considered an offence under Article 12 1(a).

2.14 The judgment does, however, recognise that there "*will come a point where the level of risk in terms of probabilities and numbers affected could, if known, lay the foundation for criminal liability*". In other words when the likely extent of incidental killing is significant in terms of the conservation of the species, it could be argued that an offence would be committed. In this particular case the Judge concluded that "*that is a long way from this case, given the evidence was of a low or negligible risk*."

European Communities (Birds and Natural Habitats) Regulations 2011 S.I. 477 of 2011 (as amended)

2.15 The European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) is the enacting legislation in Ireland for the Habitats Directive. The provisions of Article 12 of the Habitats Directive are set out in Regulation 51, which states:

51. (1) The Minister shall take the requisite measures to establish a system of strict protection for the fauna consisting of the species referred to in Part 1 of the First Schedule.

(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule—

(a) deliberately captures or kills any specimen of these species in the wild,

(b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,

(c) deliberately takes or destroys eggs of those species from the wild,

(d) damages or destroys a breeding site or resting place of such an animal, or

(e) keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive,

shall be guilty of an offence.

(3) The prohibitions referred to in paragraph (2) shall apply to all stages of life of the biological cycle of fauna to which this Regulation applies.

(4) The Minister shall establish a system to monitor the incidental capture and killing of fauna consisting of the animal species referred to in Part 1 of the First Schedule and, having regard to the information gathered, he or she shall conduct further research or take such conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.

Relevant Case Law

2.16 A further HRA judgment (Holohan & Ors. v An Bord Pleanála, 7 November 2018, C - 461/17) has also been considered within this assessment. In summary this judgement provides further clarification about the scope of an assessment, requiring that all habitats and species associated with a European site must be considered (irrespective of whether or not they are qualifying features) if impacts on those habitats and species are liable to affect the conservation objectives of the site. This assessment has considered the requirements established through this judgment.

3 Scope of the Assessment

3.1 The Zone of Influence (ZoI) for the development is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This may extend beyond the Site boundary. The ZoI has been used to determine the extent of the desktop study and baseline ecological surveys.

3.2 Departmental guidance (DoEHLG, 2009) states that:

'A distance of 15 km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15 km, and in some cases less than 100 m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects'.

3.3 This guidance therefore implies that a 15 km ZoI could represent a highly precautionary approach for some developments; however, if a reduced ZoI is to be adopted then there should be robust technical justification to support this.

3.4 The first step in determining the ZoI is to analyse the characteristics of the development and to identify the range of ZoI using the source-pathway-receptor conceptual model. The mechanism for defining the ZoI is summarised as follows:

- The nature, size and location of the development have been considered;
- The sensitivities of the relevant ecological receptors (bats and otter) have been considered; and
- The potential impact sources and pathways have been identified.

3.5 Bats are highly mobile and are capable of travelling large distances when foraging and during migration. In the vicinity of a bat roost, habitat availability and quality is likely to have an influence on the resilience and conservation status of that roost. These habitats collectively form what is referred to as the Core Sustenance Zone[2] (CSZ).

3.6 For Irish bat species the CSZ is reported to range from approximately 1 to 4 km (Collins, 2016), although individual flights can be longer. Shiel *et al*. (1999) found that the maximum (mean) flight distance recorded for individuals from two Leisler's bat maternity roosts ranged from approximately 4.5 km to 7.5 km throughout the year. Given the long distances that can be travelled by bats, a ZoI of 10 km is considered appropriate when assessing the impact of the Derrybrien Wind Farm on bats. This distance is supported by current guidance on assessing impacts of wind farms on bats, 'Bats and onshore wind turbines: survey, assessment and mitigation' (SNH *et al*., 2019) and EUROBATS Guidelines for consideration of bats in windfarm projects (Rodrigues *et al*., 2015), which both suggest that relevant bat information within 10 km of the proposed wind energy site is obtained as well as the location, number and size of turbines in other wind energy developments within the surrounding 10 km.

3.7 Based on this review a precautionary ZoI of 15 km is considered to be appropriate for bats for the purposes of this report, and highly unlikely to result in effects on bats not being assessed.

3.8 Otters may have ranges that extend over many km; however, the impacts of the Wind Farm and the associated peat slide are only likely to extend over a relatively short distance. Otter is an adaptable species and, whilst disturbance may take place during the construction phase of a wind farm, it is likely that they will become habituated to operating wind turbines (which are typically set back from watercourses). Consequently disturbance effects from an operational wind farm are not expected to be wide-ranging.

[2] The term 'core sustenance zone' refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost (Collins, 2016).

3.9 The peat slide may have impacted directly on otter within the footprint of the slide, and water quality impacts are considered to have extended downstream. An otter survey has been undertaken of the Owendalulleegh River from Flaggy Bridge (located on the R353) to Lough Cutra. In addition, otter signs were recorded on the tributary impacted by the peat slide from Flaggy Bridge downstream to the confluence of the main channel of the Owendalulleegh and a further kilometre along the main channel down to Toornaglassa Ford. Signs of otter were also recorded on the Boleyneendorrish River.

4 Establishing the Ecological Baseline

Desktop Study: Bats

4.1 A desktop study was carried out to collate the available information on bat presence to inform the assessment. The following databases, websites and reports have been consulted:

- The National Parks and Wildlife Service (NPWS) of the Department of Culture, Heritage and the Gaeltacht (www.npws.ie);
- The National Biodiversity Data Centre (NDBC) (www.biodiversityireland.ie);
- Bat Conservation Ireland (www.batconservationireland.org);
- Aerial photography (past and present) and photographs taken at the site;
- Ordnance survey data (past and present) www.osi.ie;
- Information on the status of EU protected habitats and species in Ireland (NPWS, 2019a, 2019b and 2019c);
- Review of specially requested records from the NPWS Rare and Protected Species Database for the hectads which overlap with the study area.
- Monitoring data for the Lesser Horseshoe Roost at Lough Cutra Castle was provided by National Parks and Wildlife Service.
- A search of the local planning authorities' websites for planning applications with bat data within 10 km of the Derrybrien Wind Farm within the last 10 years.
- Galway County Council Planning Website http://www.eplanning.ie/GalwayCC/searchexact to search for planning applications.
- Environmental Report for the Galway County Development Plan 2015-2021.
- Natura Impact Report in Support of the Appropriate Assessment of the Galway County Development Plan 2015-2021.
- National Biodiversity Plan 2017 – 2021. Department of Culture, Heritage and the Gaeltacht (NPWS, 2017).

4.2 All designated sites for nature conservation within a 15 km radius of the project have been identified and those that include bats as a qualifying feature have been included for assessment in this report. Designated sites and biodiversity features of interest outside of the 15 km radius are considered not to have the potential to have been affected by the project for the reasons set out in Section 3.

Desktop Study: Otter

4.3 No desktop study has been completed for otter as no data are available prior to the peat slide in 2003.

4.4 A desktop study was carried out to collate the available information on aquatic invertebrates and fish to inform the assessment. The following databases, websites and reports have been consulted:

- Inland Fisheries Ireland (IFI) Water Framework Directive (WFD) fish survey reports on the Water Framework Directive (WFD) Fish web site.
- Environmental Protection Agency (EPA) online mapping of recent and historical macroinvertebrate Q-value results for each of the main rivers draining the study area.
- EPA online mapping for WFD status and constituent components for Lough Cutra.
- Geological maps for the study area on the GSI website.

- Water chemistry data (2007-2018) for the Owendalulleegh River provided on request by the EPA.
- One-off water chemistry data for November 2003 for Lough Cutra provided by the EPA.
- Other water chemistry data and ecological data provided on request by the EPA for Lough Cutra, some dating back to 2000.
- Water chemistry data provided by Galway County Council for the period of the peat slide as part of their monitoring of the impacts on the Gort public water supply.
- Galway Bay South East Catchment Assessment (2010-2015) (EPA, 2018).
- Coillte Forestry Management Unit Maps for the Study Area.
- Relevant reports and papers in the scientific literature.
- Reports of surveys undertaken by the then Shannon Regional Fisheries Boards and consultants for the ESBI at the time of the peat slide and a few years afterwards.
- Mapping provided by ESBI on all aspects of the Derrybrien Windfarm layout before, during and after construction and along the OHL line route and Agannygal substation.

4.5 Limited consultation was undertaken with the EPA about the current and historical trophic status and ecological status of Lough Cutra. IFI (Shannon Region) was contacted about the fish kill on the Owendalulleegh River which followed the October 2003 peat slide, and an officer of a local angling club was contacted in relation to current and historical fishing activity on Lough Cutra, as well as any recollections of the condition of the lake immediately after the 2003 peat slide.

Field Surveys: Bats

4.6 Field surveys undertaken to monitor the ecological impact of the Wind Farm project on bats commenced post-construction. The survey methods employed were in line with best practice methods available at the time.

4.7 Very limited data were available regarding the local bat population in the Slieve Aughty Mountains prior to monitoring surveys commencing in 2011.

Bat survey 2011

4.8 Bat activity surveys were commissioned by Gort Wind Farms Ltd. in 2011 to determine what species were present and the level of bat activity on the Wind Farm site. A single bat activity survey was undertaken on 5 November 2011 (Wilson, 2012), which involved each turbine being visited using a driven transect methodology. All bat activity was recorded.

Bat Survey 2016

4.9 Bat surveys were carried out by BSG Ecology in 2016 using methods that were devised from the current guidance at that time published by Bat Conservation Ireland (BCI, 2012), Natural England (2014) and the Bat Conservation Trust (Hundt, 2012). The surveys carried out are summarised below.

Driven transect survey

4.10 Driven transect surveys were carried out in April, June and August 2016. The survey route was designed to sample bat activity across the whole site, passing as many turbines as possible without repeatedly driving along the same tracks. The car was driven at a constant speed of 15 mph and a Song Meter SM2BAT+ detector was used to record all bat activity. The direction that the route was driven was alternated between surveys. All surveys were carried out in suitable weather conditions: they started at sunset and took approximately 2.5 hours to complete (Hundt, 2012).

Static detector monitoring

4.11 The site was divided into three broad areas in order to allocate static detectors across the range of habitats present on site:

- The **western area** (turbines including and west of T11, T17 and T23), which was formerly afforested and cleared for wind farm construction.
- The **eastern area** (turbines including and east of T24 - 26), which included cutover bog bounded to the north and south by plantation.
- The **central and northern area**, which comprised a mixture of acid grassland and heather moor with small retained forest coupes. A flooded borrow pit/quarry and a number of small waterbodies were also present.

4.12 Song Meter (SM2+) bat detectors with external microphones were deployed in each of the above areas in order to obtain representative coverage of the habitats present (18 bat detector locations in total). An external microphone was connected via a cable to the logger and attached to a pole or suitable tree approximately 2 m above ground level.

4.13 The following turbine locations were selected for detector deployment in 2016:

- Western area: T5, T18, T21 (forest edge); T59, T13, T15, T11 (grassland and moorland areas);
- Eastern area: T32, T33, T41 (forest edge); T27 (cutover bog);
- Central and northern area: T54, T62, T67 (on potential bat commuting routes between retained forest compartments); T65 (close to water body); T17, T70, T71 (forest edge.)

4.14 The static detectors were deployed for five consecutive nights each month from April to August inclusive. The detectors were set to record from half an hour before sunset to half an hour after sunrise.

Bat mortality (corpse) searches

4.15 BSG Ecology contracted Conservation Dogs (part of Wagtail UK) to complete carcass searches within the Wind Farm site. The objective of the bat carcass searches was to identify whether there was any evidence that the operation of the Derrybrien Wind Farm was resulting in bat mortality. Those turbines where the highest levels of bat activity had been recorded (based on data collected using static detectors) were targeted for searching by the dogs (rEIAR, Chapter 7, Section 7.2.6.3.2, Bat Mortality (Corpse) Searches).

4.16 Dogs were used to search an area extending 60 m around each turbine tower. This included areas of hard-standing as well as semi-natural habitats.

4.17 Searches were conducted on the mornings of 31 August and 1 September 2016 at 6 turbine locations (T11, T17, T18, T21, T27, and T71). In the event a bat carcass was found, the turbine it was under was noted, as well as the position of the bat in relation to it (distance and direction from turbine base). The bat species was identified on site where possible, and if this could not be achieved (due to decomposition or inconclusive biometric data), the corpse was removed for identification via DNA analysis.

4.18 In order to provide some information on the rate at which the corpses of dead animals are removed from the site (and therefore not be available for dogs to find), scavenger removal trials were completed prior to searches being carried out for dead bats.

Data Analysis

4.19 Recorded bat calls were analysed using Analook software to confirm the identity of the bats present. Where possible, the bat was identified to species level. Species of the genus *Myotis* were grouped together as overlapping call parameters, make species identification problematic, as were long-eared bat species (Hundt, 2012).

4.20 For Pipistrelle species the following criteria, based on measurements of peak frequency, were used to classify calls:

- common pipistrelle ≥42 and <49 kHz
- soprano pipistrelle ≥51 kHz
- Nathusius' pipistrelle <39 kHz
- common pipistrelle / soprano pipistrelle ≥49 and <51 kHz
- common pipistrelle / Nathusius' pipistrelle ≥39 and <42 kHz

4.21 Bat calls that could not be ascribed to any of these categories were not used in the analysis.

4.22 AnalookW (Version 3.8, 2010) software was used for all analysis of bat calls. The software enables analysis of the relative activity (referred to as 'activity' in the report) of different species of bats by counting the number of bat passes (B) recorded within a unit of time (hour (h) was used). More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously.

4.23 During analysis of sound files, it was possible to estimate the minimum number of bats recorded on individual sound files but not whether consecutive sound files had recorded one bat or multiple bats. Although relative abundance cannot be estimated from this analysis, the number of bat passes does provide an indication of the importance of features/habitats to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity.

Bat survey 2019

4.24 Bat survey methods employed by BSG Ecology in 2019 were devised with reference to guidance documents produced by BCI (2012), and multi-agency guidance published by Scottish Natural Heritage (SNH *et al*., 2019).

4.25 Sampling was completed during the period 29 August to 8 October 2019 at each of 32 turbine locations using static detectors (11 detectors were rotated between the 32 locations). The same locations were sampled as the surveys in 2016, along with an additional 14 locations which were spread evenly across the site. Ten consecutive nights of data were collected at each location, and the bat data were analysed using the same method as used for the 2016 data.

Field Surveys: Otter

4.26 Field surveys have been undertaken to monitor the ecological impact of the Wind Farm project on otter and other aquatic ecological features. The following surveys have been completed:

- A survey of the Owendalulleegh River was undertaken by the Shannon Regional Fisheries Board (SRFB) and Inis Environmental Services between the 9th – 22nd December 2003;
- A dedicated otter survey of the Wind Farm site was undertaken in 2018 on behalf of ESB;
- Otter signs were recorded on August 25th 2018 during aquatic habitat surveys of the tributary impacted by the peat slide from Flaggy Bridge downstream to the confluence of the main channel of the Owendalulleegh and a further kilometre along the main channel down to Toornaglassa Ford;
- Otter signs were recorded while undertaking Q-value assessments on the Boleyneendorrish River on October 10th 2018;
- Macroinvertebrate Q-value surveys in 2011, 2014, 2018, 2019 and 2020;
- Electrofishing surveys in 2011, 2014 and 2019;
- Water chemistry surveys in 2011, 2018 and 2019;.
- A benthic grab sampling survey in Lough Cutra, to characterise the nature of the bottom substrates in the lake and to assess the type of soft sediment benthic macroinvertebrates present (October 2019).

Otter surveys

4.27 A survey of the Owendalulleegh River was undertaken by the Shannon Regional Fisheries Board (SRFB) and Inis Environmental Services between the 9th – 22nd December 2003. An OS 6" map of the river channel from Flaggy Bridge (located on the R353) to Lough Cutra was chained in 100 m sections according to the system used by the Office of Public Works and the Central Fisheries Board. The survey involved a visual assessment of the river, its banks, the instream vegetation and the nature and condition of the riverbed substrate. Animal tracks and signs, including those of otter, were recorded during the survey.

4.28 A dedicated otter survey of the Wind Farm site was undertaken in 2018. A thorough search of the drains on the Wind Farm site was undertaken on 20th July. In addition, otter signs were recorded on August 25th 2018 during aquatic habitat surveys of the tributary impacted by the peat slide from Flaggy Bridge downstream to the confluence of the main channel of the Owendalulleegh and a further kilometre along the main channel down to Toornaglassa Ford. Signs of otter were also recorded while undertaking Q-value assessments on the Boleyneendorrish River on October 10th 2018.

Macroinvertebrate Q-value survey

4.29 A total of 37 sites were surveyed for Q-value assessment[3] within the project drainage area and some small adjoining watercourses. Several sites were surveyed in more than one year. The sites were distributed along the main channel of the Owendalulleegh and Boleyneendorrish rivers, as well as on the smaller streams in these catchments draining the Wind Farm site or lands immediately adjoining the Wind Farm site. Two sites were also surveyed in the Duniry catchment to which a tiny portion of the footprint of the Wind Farm drains to the east. Finally, two sites were surveyed on two small streams draining the OHL corridor and the Agannygal substation, one that eventually joins the main channel of the Owendalulleegh and the other which flows into the northern shore of Lough Atorick to the south of the study area.

Electrofishing surveys

4.30 Electrofishing surveys were carried out at a total of 19 sites during 2011 (12 sites), 2014 (6 sites), 2019 (11 sites). Several sites were visited on more than one occasion across the three survey years. Survey sites were situated mainly on tributary streams draining the Wind Farm site in the two main catchments (Owendalulleegh and Boleyneendorrish) but also at a number of main channel sites in both catchments and at a site in the upper reaches of the Duniry catchment (2011).

Water chemistry surveys

4.31 Water chemistry surveys were undertaken at 27 sites during 2011 (11 sites), 2018 (7 sites) and 2019 (15 sites). The sites were mainly situated on tributaries rather than on the main channels. Chemistry data were collected to characterise surface waters using a range of parameters including pH, conductivity, alkalinity, anions and cations, i.e. those that would be influenced by the nature of the overburden as well as the underlying geology in the various sub-catchments. In addition, the nutrient content was assessed to see if these data could help explain some of the water quality findings derived from the Q-value surveys.

Grab Sampling for Sediments and Invertebrates on Lough Cutra

4.32 A single Van Veen grab sample was taken of the bottom sediment at 11 sites from the lower reaches of the Owendalulleegh River to the outflow of the Beagh River. Grainsize analysis was carried out on oven-dried sediment samples from each site. Organic matter was estimated using the Loss on Ignition (LOI) method. Macroinvertebrates were extracted after sieving fresh samples through a 1 mm sieve and preserved in 70% ethanol. They were subsequently identified.

[3] The Q-rating biotic index is used by the EPA on all river water monitoring programmes in Ireland and is based on interpreting collections of aquatic macroinvertebrates. The index assigns a score to the macroinvertebrates collected at a given site, depending on the relative proportion of pollution sensitive and pollution tolerant organisms present.

Survey Limitations: Bats

4.33 Bats were not specifically considered in the original EIS documents prepared between 1998 and 2001. Therefore, the pre-construction use of the site by bats, and their use of the site during construction and during the operation phase (up to 2016) cannot be characterised based on empirical data. Instead assumptions have been made as to the likely use of the area by bats based on habitat type, species present in the wider area and knowledge of species ecology.

4.34 The first detailed bat surveys of the site were completed in spring and summer 2016, ten years into the operational period. The autumn period was not included in the scope of the survey work at this time. Further detailed survey work to address this data gap was undertaken in autumn 2019.

4.35 Data collected on bat mortality were collected on two survey occasions in early Autumn 2016, when 6 turbine locations were sampled. Data have not been collected during the spring and summer periods. Whilst the resultant data provide an indication of the potential impacts of the Wind Farm on bats, the data are limited by their temporal and spatial scope. Nevertheless, these limitations have been acknowledged and considered in the proposed mitigation strategy.

Survey Limitations: Otter

4.36 Otter was not specifically considered in the original EIS documents prepared between 1998 and 2001. The first survey for otter was in 2003 to inform the assessment of impacts of the peat slide on the Owendalulleegh River. The first survey of the wind farm site was in 2018. Therefore, the pre-construction use of the site by otter cannot be characterised based on empirical data. The use of the site by otter during the construction and operation phases has necessarily been based on the results of the surveys in 2003 and 2018. Assumptions have been made as to the likely use of the area by otter based on habitat type and knowledge of species ecology.

4.37 It is assumed that otter activity recorded during surveys undertaken in 2003 is likely to be similar to the situation on site pre-development. This assumption is supported by water quality data, which show that the watercourses were consistently High Status before the peat slide and recovered to High Status within three years of the peat slide (rEIAR, Chapter 8, Section 8.2.4.1, EPA Monitoring).

5 Defining the Ecological Baseline

European Sites Classified for Bats

5.1 The Wind Farm site is within the Slieve Aughty Mountains SPA, which was classified as a SPA in March 2007 for hen harrier and merlin. As the SPA has been classified for its avian interest, it is not considered further in this assessment.

5.2 The potential for the Wind Farm to impact on European sites within the 15 km ZoI (see Section 3) has been considered as part of this assessment where those sites include bats as a qualifying feature. The ZoI applies to all aspects of the Wind Farm, including the Wind Farm site, overhead line (OHL) and Agannygal Substation.

5.3 In addition to the Slieve Aughty Mountains SPA, there are 23 other European designated sites within 15 km of the Wind Farm. Only two sites are designated for the bat population that they support:

- Lough Cutra SAC (reference 000299), which is noted for the population of lesser horseshoe bat *Rhinolophus hipposideros* that it supports. The SAC is located 10 km to the south-west at its closest point.
- Kiltartan Cave (Coole) SAC (reference 000286), which is noted for the population of lesser horseshoe bat that it supports. The SAC is located 12.7 km to the west at its closest point.

5.4 As noted in Section 3, a 15 km ZoI for bats is precautionary: guidance (SNH *et al*., 2019; Rodrigues *et al*., 2015) indicates that 10 km is an appropriate study area for these species. It is unlikely that bats associated with either SAC will commute as far as the Wind Farm due to the separation distance and the habitats that are present between the sites. This is supported by the results of the survey work completed to date, which have not recorded lesser horseshoe bat within the Wind Farm site.

European Sites Classified for Otter

5.5 There are no European sites within the Wind Farm ZoI where otter is a qualifying feature.

Pre-construction baseline data for bats: 1998-2001

5.6 There are no baseline data available for bats between 1998 and 2001. It has therefore been assumed for the purpose of this assessment, that all bat species identified during field surveys completed from 2011 onwards (i.e. during the operational phase of the Wind Farm) were present pre-construction. Although the extent and condition of habitats within the site have varied during the different phases of the project, it is not likely that this variation would have resulted in significant variation in the bat species composition that was recorded.

Construction Phase Data for bats: 2003-2006

5.7 There are no bat data available for the construction phase of the development. The assumptions set out in Section 5.6 for the pre-construction period also apply for the construction phase.

Operation Phase Data for bats: 2006-2019

Desktop study data

5.8 The desktop study completed in 2012 (Wilson, 2012) returned BCI records of two lesser horseshoe bat roosts, at Thor Ballylee and Cloonbeg (both in County Galway) 9.3 km and 10 km west of the site respectively. In addition, records were returned of roosts of brown long-eared bat *Plecotus auritus*, soprano pipistrelle *Pipistrellus pygmaeus* and *Myotis* sp. at a location approximately 10 km to the east of the site.

5.9 Bat records obtained from the National Biodiversity Data Centre during the same desk study indicated that common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle, Nathusius' pipistrelle *Pipistrellus nathusii*, lesser horseshoe bat, Leisler's bat *Nyctalus leisleri*, brown long-eared bat, Daubenton's bat *Myotis daubentonii*, whiskered bat *Myotis mystacinus*, and Natterer's bat *Myotis nattereri* have been recorded within 10 km of the site.

5.10 The results of the desk study therefore indicate that a range of species could be present within the Wind Farm site; however, no records have been returned for the site itself.

Bat survey results 2011

5.11 Two bat passes were recorded during the bat activity surveys completed in 2011: a bat pass that could not be identified to species and a bat pass from an unidentified pipistrelle species. As the survey was carried out towards the end of the bats' active season, the results are likely to be an under-representation of bat activity at the site.

5.12 No roosts were identified in the desktop study completed in the 2011 bat assessment, although it was noted that there are buildings in the area around the Wind Farm which might support roosting bats. These buildings were off-site and were not inspected. The closest building to the wind turbines identified on aerial imagery is approximately 1.3 km to the south-east (Bing Maps, 2019).

5.13 The data from the 2011 survey are too limited in their scope to allow meaningful analysis.

Bat survey results 2016

5.14 Driven transect surveys carried out on 20 April, 29 June and 8 August 2016 recorded a total of 14 bat passes: 12 Leisler's bat passes in April; one common pipistrelle and one soprano pipistrelle pass in August. No bat passes were recorded in June. All of the passes were recorded in the central – eastern sections of the site.

5.15 Static bat detectors deployed in 2016 recorded bat calls for a combined total of 406 nights[4], equating to 3,290.5 hours of survey time during the period April-August 2016. Table 1 provides details of the number of bat passes and activity recorded during automated detector surveys. A total of 13,109 passes from at least five species of bat were recorded**.**

Table 1: Total number of bat passes (P) and activity (P/h) for each bat species recorded during automated surveys in 2016.

Species	**P**	**P/h**
Common / Nathusius' pipistrelle	82	<0.1
Common pipistrelle	2,751	0.8
Common / Soprano pipistrelle	49	<0.1
Soprano pipistrelle	360	0.1
Myotis species	97	<0.1
Myotis / Long-eared bat sp.	3	<0.1
Long eared bat sp.	20	<0.1
Leisler's bat	9,747	3.0
Total	**13,109**	**4.0**

[4] The total number of nights is calculated by multiplying the number of detector locations by the number of nights minus those nights where the detector failed.

5.16 The highest activity rate was recorded for Leisler's bat, at an average of 3 P/h: 74% of all the recorded bat passes were identified as Leisler's bats. The next most commonly recorded species were common pipistrelle (0.8 P/h) and soprano pipistrelle (0.1 P/h). *Myotis* species and long-eared bat sp. were both recorded at low encounter rates of <0.1 P/h (97 and 20 bat passes respectively). There were 82 passes which fell within the overlapping call parameters for both common and Nathusius' pipistrelle[5] and 49 passes which fell within the overlapping call parameters for soprano and common pipistrelle.

5.17 The data presented in Table A1 (Appendix 1) show that higher relative levels of bat activity were recorded in April, May and June (7.5, 6.4 and 6.2 P/h) than in July and August (0.7 and 0.4 P/h) in 2016. Monthly changes in activity for individual species are discussed below. Table A2 (Appendix 1) shows the bat activity recorded at each turbine location in 2016 and Table A3 (Appendix 1) presents a summary of the monitoring data for 2019.

5.18 The highest levels of activity (>7 P/h) were recorded at turbines T33, T71, T70, and T27. All of these detectors were located near to the densest areas of coniferous plantation. Turbines T5, T11, T17, T18, T21, T32, T41, T54 and T65 had activity between 2 and 5 P/h: most of these locations are bordered on at least one side by plantation woodland with the exception of T17 (although there is a block of plantation to the east) and T11 which is in an open area. Turbines T13, T16, T62 and T67 had activity of <1 P/h: all of these are in more open areas. Differences in activity for individual bat species at each detector location are discussed below.

Leisler's bat

5.19 Leisler's bats were recorded during every month of survey. There was a peak in activity in April and May (7.0 and 6.2 P/h respectively), and a marked decrease in activity in June, July and August (0.9, 0.3 And 0.2 P/h).

5.20 The highest levels of activity were recorded in locations T33, T71, T70 and T27. Lower levels of activity (between 4.2 and 1.9 P/h) were recorded at T21, T18, T17, T65, T54 and T11. The lowest levels of relative activity (<1.4 P/h) were recorded at T5, T13, T15, T32, T41, T59, T62 and T67.

5.21 In April the highest levels of activity were recorded at T21 and T71 (both 21.6 P/h) followed by T70, T17 and T18 (17.4, 14.1 and 12.5 P/h respectively). All other locations had activity below 7 P/h. In May, the highest levels of activity were recorded at T33 (40.8 P/h) followed by T21, T70, T65 and T27 (17.9, 10.3, 6.9 and 5.4 P/h respectively) with 3.1 P/h or less recorded at all other locations. In June the highest level of activity was recorded at T65 (5.6 P/h) with 1 P/h or less recorded at all other locations for July and August all locations recorded 1.1 P/h or less.

5.22 The highest activity was recorded from 61 minutes after sunset (4.2 P/h), with a peak 101-120 mins after sunset (6.1 P/h), continued through the night (5.9 P/h) until 101 minutes before sunrise when activity reduced. Low activity was recorded within the 20 minutes after sunset and before sunrise (<0.1 and 0.2 P/h respectively). A total of 33 Leisler's bat passes were recorded before sunset (7 bat passes) or after sunrise (26 bat passes). Early / late bat passes were recorded at T27, T67 T18 and T41 over nine separate nights.

Common pipistrelle

5.23 Common pipistrelles were recorded during every month of survey. There was a peak in activity in June (4.5 P/h), and lower levels of activity in April, May, July and August (0.4, 0.1, 0.1 and 0.4 P/h respectively).

5.24 The highest level of activity was recorded at T41 (2.7 P/h) followed by T32, T33, T71 and T65 (2, 1.9, 1.9 and 1.4 P/h respectively). Activity at all other detector locations was less than 1 bat pass per hour.

5.25 In June the highest levels of activity were recorded at T41 and T32 (14.9 and 11.3 P/h) followed by T65, T33 and T27 (6.1, 5.9 and 4.3 P/h respectively). All other locations had activity below 3.7 P/h.

[5] There was no clear evidence that Nathusius' pipistrelle was present during the period sampled. Overlapping call parameters are often encountered when carrying out wind farm monitoring work.

Soprano pipistrelle

5.26 Soprano pipistrelles were recorded during every month of survey and at all detector locations, apart from those located at T59 and T67. There was a peak in activity in June (0.6 P/h), and low activity in April, May, July and August (all <0.1 P/h).

5.27 The highest level of activity was recorded at T41 (0.6 P/h) followed by T65 and T33 (0.5 and 0.2 P/h respectively). Activity at all other detector locations was 0.1 bat passes per hour or less.

5.28 In June the highest levels of activity were recorded at T41 and T65 (2.9 and 1.8 P/h) followed by T32 and T33 (Both 0.6 P/h). All other locations had activity below 0.5 P/h.

Myotis sp.

5.29 *Myotis* sp. bats were recorded during every month of survey and at all detector locations, apart from T62. The highest activity was recorded in June (0.1 P/h). All other months had activity of <0.1 P/h. The highest levels of activity were recorded at T11, T17 and T18 (0.1 P/h). Activity at all other detector locations was less than 0.1 bat pass per hour.

Brown long-eared bat

5.30 Brown long-eared bat was recorded during every month of survey, apart from June. Low numbers of passes were recorded at nine detector locations (T5, T11, T13, T15, T18, T27, T32, T41 and T70). The highest activity was recorded in June (0.1 P/h). All other months had activity of <0.1 P/h. The highest levels of activity were recorded at T11, T17 and T18 (0.1 P/h). Activity at all other detector locations was less than 0.1 bat pass per hour.

Carcass searches and scavenger removal trials

5.31 During the carcass searches one dead bat was found by the search team. This bat (a soprano pipistrelle) was found at turbine T11. Although searcher efficiency trials were not carried out, trials from other sites using the same dog team in similar habitats (in Wales and Scotland) suggests an efficiency level of 80% or higher is likely.

5.32 The scavenger removal trial found that mouse carcasses were removed at rates that ranged from 1 to 7 days (average of 5 days removal rate).

Summary observations from 2016 data

5.33 Bat monitoring in 2016 identified a range of species that use the site, with activity levels being relatively low for most species and showing seasonal variability as well as variability between turbine locations (albeit that these observations are based on one year's data). Leisler's bat was recorded most frequently, with the species being recorded during every month of survey. There was a peak in activity in April and May and a marked decrease in activity in June, July and August.

5.34 Common pipistrelle was the next most frequently recorded species, also being recorded during every month of survey. There was a peak in activity in June. Bat activity rates for common pipistrelle were generally quite low. All other species were recorded less frequently and bat activity rates were low.

Bat survey results 2019

Static bat detector survey

5.35 Static bat detectors recorded bat calls for a combined total of 311 nights, equating to 3,519 hours of survey time during Autumn 2019. Table 2 presents the number of bat passes and activity recorded during automated detector surveys. A total of 16,264 passes from at least six species of bat were recorded.

Table 2: Total number of bat passes (P) and activity (P/h) for each bat species recorded during automated surveys in 2019.

Species	P	P/h
Nathusius' pipistrelle	7	<0.1
Common / Nathusius' pipistrelle	189	0.1
Common pipistrelle	8,397	2.4
Common / Soprano pipistrelle	1,473	0.4
Soprano pipistrelle	2,971	0.8
Myotis species	590	0.2
Myotis / brown long-eared bat	144	<0.1
Brown long-eared bat	156	<0.1
Leisler's bat	2,039	0.6
Unidentified bat species	298	0.1
Total	**16,264**	**4.6**

5.36 Table A3 (Appendix 1) shows the bat activity recorded at each turbine location in 2019.

5.37 The highest activity rate was recorded for common pipistrelle, at an average of 2.4 P/h; 51% of all recorded passes were identified as common pipistrelle. The next most commonly recorded species were soprano pipistrelle (0.8 P/h) and Leisler's bat (0.6 P/h). *Myotis* species and long-eared bat sp. were both recorded at low frequencies 0.2 P/h and <0.1 P/h respectively. Seven Nathusius' pipistrelle passes were recorded. There were 189 passes which fell within the call parameters for both common and Nathusius' pipistrelle and 1,473 passes which fell within the call parameters for soprano and common pipistrelle.

5.38 The highest levels of overall bat activity (34.1 P/h) were recorded at turbine T2, followed by T69, T38, T32 and T49 (all of which recorded between 10.7 and 15.8 P/h). All of these detectors were located near to the areas of plantation woodland. Turbines T37, T39, T15 and T51 had activity of <0.2 P/h. Differences in activity for individual bat species at each detector location are discussed below.

Leisler's bat

5.39 The highest levels of activity (2.0 – 2.6 P/h) were recorded in locations T69, T38, T2 and T49. The lowest levels of relative activity (<0.1 P/h) were recorded at T32, T67, T15, T39, T62, and T41. No Leisler's bats were recorded at T51.

Nathusius' pipistrelle

5.40 Seven confirmed Nathusius' pipistrelle passes were recorded during the surveys. One pass was recorded at T33 in the middle of the night on 7 September 2019 and six passes were recorded at T28 in the middle of the night on 11 September 2019. The six passes all occurred within a two minute period.

Common pipistrelle

5.41 The highest level of activity was recorded at T2 (21.9 P/h) followed by T38, T69, T32, T13 and T18 (7.2, 6.4, 5.1, 4.7 and 4.6 P/h respectively). Activity at a further ten locations was between 1 and 3 P/h, the remaining sixteen recorded <1 P/h.

Soprano pipistrelle

5.42 The highest level of activity was recorded at T2 (6.9 P/h) followed by T69, T49, T38 and T32 (4.2, 3.6, 2.3 and 1.4 P/h respectively). Activity at all other locations was between <1 P/h.

Myotis sp.

5.43 *Myotis* sp. bats were recorded at all turbine locations, apart from T39. The highest levels of activity was recorded at T32 (2.8 P/h); activity at all other locations was <0.4 P/h.

Brown long-eared bat

5.44 Brown long-eared bat was recorded at 21 turbine locations (of 32 locations sampled). The highest activity was recorded at T44 (0.3 P/h) and T32 (0.2 P/h). Activity was 0.1 P/h or under at all other locations brown long-eared bat was recorded.

Summary observations for bats from 2019 data

5.45 Bat monitoring in 2019 identified a range of species that use the site, with activity levels being relatively low for most species and showing seasonal variability as well as variability between turbine locations (albeit that these observations are based on one year's data). Common pipistrelle was recorded most frequently, followed by soprano pipistrelle and Leisler's bat. All other species were recorded less frequently and bat activity rates were low.

Pre-construction baseline data for otter: pre-2003

5.46 There are no baseline data available for otter pre-2003. It has therefore been assumed for the purpose of this assessment, that otters identified during field surveys completed from 2003 onwards (i.e. during the operational phase of the Wind Farm) were present pre-construction. Although the extent and condition of habitats within the site have varied during the different phases of the project, it is not likely that this variation would have resulted in significant variation in how otter has used the site. Their use of the site likely to have been limited by factors such as prey availability.

Construction Phase Data for otter: 2003-2006

5.47 During the survey of the Owendalulleegh River undertaken by the SRFB and Inis Environmental Services in December 2003, otter signs were recorded at a number of locations along the Owendalulleegh. Otter tracks were recorded on the tributary below Flaggy Bridge and at several locations along the main channel of the Owendalulleegh. No signs were recorded to indicate that breeding otter were present, i.e. no natal holts were recorded.

Operation Phase Data for otter: 2006-2020

5.48 No signs of otter were recorded during the survey of the Wind Farm site undertaken on 20th July 2018.

5.49 In August 2018 four sprainting sites were noted on the Flaggy Bridge tributary, and a further spraint was noted downstream of the confluence on the main channel. While undertaking Q-value assessments on the Boleyneendorrish River on October 10th 2018 a spraint was also recorded. These observations led to the conclusion that otter use all of the main channels of the 3 main catchments and are likely to use substantial proportions of all of the side tributaries also for feeding and marking (rEIAR, Chapter 7, Otter Assessment).

6 Evaluation of Species Vulnerability

Evaluation of Vulnerability of Bat Assemblage

6.1 Industry standard guidance (SNH *et al*., 2019) suggests that the vulnerability of bat populations to wind farms is based on three factors:

1. Relative abundance;
2. Collision risk; and
3. Bat activity recorded at the site.

6.2 Relative abundance is defined as 'common', 'rarer' and 'rarest' (SNH *et al*., 2019), which is adapted from criteria presented by Wray *et al*. (2010), where:

- Rarest indicates populations under 10,000 within range (national);
- Rarer indicates populations numbering 10,000 – 100,000 within range (national);
- Common indicates populations over 100,000 within range (national).

6.3 Relative abundance of each British species is provided in the guidance for Scotland, England and Wales (as well as Northern Ireland in Wray *et al*., 2010), but not for Ireland. For the purposes of this chapter relative abundance has been defined for each species based on available Irish population data (Marnell *et al*., 2009).

6.4 SNH *et al*. (2019) provide a table (Table 3) categorising which bat species are potentially most vulnerable to collision based on physical and behavioural characteristics combined with evidence of casualty rates in Europe.

Table 3: Bat species which are potentially most vulnerable to collision based on physical and behavioural characteristics (source: SNH *et al*., 2019).

	Risk of turbine impact		
Factor	Low Risk	Medium Risk	High Risk
Habitat preference	Bats preferring cluttered habitat	Bats able to exploit background cluttered space	Bats preferring to use open habitat
Echolocation characteristics	• Short range • High frequency • Low intensity • Detection distance ~15m	Intermediate – more plastic in their echolocation[14]	• Long range • Low frequency • High intensity • Detection distance ~80m[15]
Wing shape	• Low wing loading • Low aspect ratio • Broadest wings	Intermediate	• High wing loading • High aspect ratio • Narrow wings
Flight speed	Slow	Intermediate	Fast
Flight behaviour and use of landscape	• Manoeuvre well • will travel in cluttered habitat • Keeps close to vegetation • Gaps may be avoided	Some flexibility	• Less able to manoeuvre • May avoid cluttered habitat • Can get away from unsuitable habitat quickly • Commute across open landscape
Hunting techniques	• Hunt close to vegetation • Exploit richer food sources in cluttered habitat • Gleaners	• Hunt in edge and gap habitat • Aerial hawkers	• Less able to exploit insect abundance in cluttered habitat • Aerial hawker • Feed in open
Migration	Local or regional movements.	Regional migrant in some parts of range	Long-range migrant in some parts of range
Conclusion	*Myotis* spp. Long eared-bats Horseshoe bats	Serotine Barbastelle	Common pipistrelle[16] Soprano pipistrelle Noctule Leisler's bat Nathusius' pipistrelle

6.5 In Table 3 it should be noted that serotine *Eptisicus serotinus*, noctule *Nyctalus noctula* and barbastelle *Barbastellus barbastellus* are not considered to be resident or regularly occurring species in Ireland.

Assessment of Bat Species Vulnerability

6.6 Bat activity at the site was not recorded in a detailed and structured manner until 2016. Therefore, for the purposes of the impact assessment, assumptions have been made with regard to bat activity based on desk study data for the wider area, relative bat species abundance in Ireland (Marnell *et al.,* 2009) and a habitat assessment for bats based on professional judgement.

Common pipistrelle (Pipistrellus pipistrellus)

6.7 The common pipistrelle is common in Ireland, and together with the soprano pipistrelle, is the most frequently recorded species (Schofield & Mitchell-Jones, 2003). The population in Ireland is thought to be stable and is estimated to comprise 100,000+ mature individuals (Marnell *et al.*, 2009). The relative abundance of common pipistrelle is considered to be 'common' in Ireland.

6.8 Common pipistrelle feed in a wide range of habitats including woodland, hedgerows, grassland, farmland, suburban and urban areas (Dietz *et al*., 2009; Schofield & Mitchell-Jones, 2003, Dietz & Keifer, 2016). Maternity roosts are mainly found in buildings, with males roosting in buildings and trees during the summer (Collins, 2016).

6.9 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition of habitats and the ratio of commercial plantation to open habitats in this area are constantly changing due for example, to the harvesting and planting of the coniferous plantation. The Wind Farm is positioned at the highest elevation in the Slieve Aughty Mountains, and is more exposed to higher winds and cooler temperatures than the lower areas. Whilst common pipistrelle is known to use exposed upland sites, there is a considerable amount of similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.10 Taking into account the results of bat monitoring, it is clear that common pipistrelle is present within the site and was the most frequently recorded species in 2019. It is a commonly occurring and widespread species that is utilising the habitats within the site for foraging; however, these habitats are widespread in the area. It is considered to be a species that is at high risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have high vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Soprano pipistrelle (Pipistrellus pygmaeus)

6.11 The soprano pipistrelle is common in Ireland, and together with common pipistrelles are the most frequently recorded species (Schofield & Mitchell-Jones, 2003). The population in Ireland is thought to be stable, and is estimated to comprise 100,000+ mature individuals (Marnell *et al*., 2009). The relative abundance of soprano pipistrelle is considered to be 'common' in Ireland.

6.12 Soprano pipistrelles typically feed in wetland habitats, for example over lakes and rivers, but also occur around woodland edge, along tree lines and hedgerows, and in suburban gardens and parks (Dietz et al., 2009; Schofield & Mitchell-Jones, 2011; Dietz & Keifer, 2016). Soprano pipistrelle maternity roosts are mainly found in buildings (typically forming larger roosts than common pipistrelle), with males roosting in buildings and trees during the summer (Collins, 2016).

6.13 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst soprano pipistrelle is known to use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.14 Taking into account the results of bat monitoring, soprano pipistrelle is a species that occurs frequently within the site. It is a commonly occurring and widespread species that is utilising the habitats within the site for foraging; however, as previously noted these habitats are widespread in the area. It is considered to be a species that is at high risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have high vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Nathusius' pipistrelle (Pipistrellus nathusii)

6.15 Information on Nathusius' pipistrelle in Ireland is limited: this species has been recorded in Northern Ireland since 1997 (Bat Conservation Ireland, 2019). The mammal red list for Ireland (2009) lists the species as of 'least concern' (Marnell *et al*., 2009). Between 2003 and 2011, 147 records of Nathusius' pipistrelle were recorded during car-based bat monitoring surveys across the island of Ireland (during 6,433 transects that were driven during this time period). The closest record to the site is 18.5 km to the south west; this was recorded in 2007. The relative abundance of Nathusius' pipistrelle is considered to be 'rarest' in Ireland.

6.16 Nathusius' pipistrelle typically forages in woodland, often near to large water bodies (Dietz et al., 2009; Schofield & Mitchell-Jones, 2011; Collins, 2016). They are strong flyers, and are long distance migrants in mainland Europe (Dietz *et al*., 2009; Marnell *et al*., 2009).

6.17 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst Nathusius' pipistrelle is known to use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.18 Taking into account the results of bat monitoring, Nathusius' pipistrelle is a species that occurs infrequently within the site. It is an uncommon species that is utilising the habitats within the site for foraging; however, as previously noted these habitats are widespread in the area. It is considered to be a species that is at high risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have moderate vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm (due to the low frequency of occurrence).

Leisler's bat (Nyctalus leisleri)

6.19 Leisler's bat is considered to be common in Ireland, which is a stronghold for the species (Schofield & Mitchell-Jones, 2003). The population in Ireland is thought to be stable, and is estimated to comprise 20,000+ mature individuals (Marnell *et al*., 2009). The mammal red list for Ireland 2009 lists the species as of 'near threatened' (Marnell *et al*., 2009). The relative abundance of Leisler's bats is considered to be 'rarer' in Ireland.

6.20 Leisler's bats typically forage just above the canopy of trees, along forest trails and fire breaks, over water-bodies and around street lamps (Schofield & Mitchell-Jones, 2003). When they are hunting over pasture land, yellow dung flies and beetles are important dietary components and available throughout the year (Dietz et al., 2009). Leisler's bats roost in both trees and buildings (Collins, 2016).

6.21 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst Leisler's bat is known to use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.22 Taking into account the results of bat monitoring, Leisler's bat is a species that occurs frequently within the site. It is a commonly occurring and widespread species that is utilising the habitats within the site for foraging; however, as previously noted these habitats are widespread in the area. It is considered to be a species that is at high risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have high vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Brown long-eared bat (Plecotus auritus)

6.23 Brown long-eared bats are common and widespread in Ireland (Schofield & Mitchell-Jones, 2011). The population in Ireland is thought to be stable, and is estimated to comprise 10,000+ mature individuals (Marnell *et al*., 2009). Results from Bat Conservation Ireland's Brown Long-eared Bat Roost Monitoring Scheme suggest that brown long-eared bat populations in Ireland are stable (Aughney et al., 2011; BCI, 2019a). The mammal red list for Ireland 2009 lists the species as of 'least concern' (Marnell *et al*., 2009). The relative abundance of brown long-eared bats is considered to be 'rarer' in Ireland.

6.24 Brown long-eared bats typically forage in woodlands, and roost in buildings and trees (Schofield & Mitchell-Jones, 2003), and have also been recorded roosting in bridges (BCI, 2010). Studies suggest that brown long-eared bats spend most of their time foraging within 500 m to 1 km of their roosts, and flight distances are typically under 10 km (Dietz et al., 2009, Hundt et al., 2012).

6.25 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst brown long-eared bat is known to use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.26 Taking into account the results of bat monitoring, brown long-eared bat is a species that occurs infrequently within the site. It is a commonly occurring and widespread species that is utilising the woodland habitats within the site for foraging; however, as previously noted these habitats are widespread in the area. It is considered to be a species that is at low risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have low vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Natterer's bat (Myotis nattereri)

6.27 Natterer's bats are widely distributed throughout Ireland (McAney, 2006; Schofield & Mitchell-Jones, 2003). The population in Ireland is thought to be stable, and is estimated to comprise 5,000+ mature individuals (Marnell *et al*., 2009). The mammal red list for Ireland 2009 lists the species as of 'least concern' (Marnell *et al*., 2009). The relative abundance of Natterer's bats is considered to be 'rarest' in Ireland.

6.28 Natterer's bats predominately forage in woodland and open parkland, and have broad wings enabling them to hunt within tree canopies or close to foliage (Dietz et al., 2009; Schofield & Mitchell-Jones, 2003). They typically roost in trees, in both crevices and voids (BTHK, 2018; Dietz et al., 2009) but have been recorded in crevices under bridges. Mortimer (2006) found 22 Natterer's bat roosts in coniferous plantation in North East Scotland, and that Natterer's were foraging within the plantation in which roosting occurred. Natterer's bats roosting sites typically change every 2-5 days and the size of some colonies varies constantly (Dietz & Keifer, 2016).

6.29 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Natterer's bat is more likely to have used the coniferous plantation that was available prior to site development than other bats, although there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.30 Taking into account the results of bat monitoring, natterer's bat is a species that occurs infrequently within the site. It is a relatively common and widespread species that is utilising the habitats within the site for foraging; however, as previously noted these habitats are widespread in the area. It is considered to be a species that is at low risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have low vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Daubenton's bat (Myotis daubentonii)

6.31 Daubenton's bat is common and widespread in Ireland (Schofield & Mitchell-Jones, 2011). Results from Bat Conservation Ireland's All Ireland Daubenton's Bat Waterways Survey suggest that the Daubenton's bat populations in Ireland is stable and comprises 10,000+ mature individuals (Marnell *et al*., 2009; Aughney *et al*., 2012; BCI, 2019b). The mammal red list for Ireland 2009 lists the species as of 'least concern' (Marnell *et al*., 2009). The relative abundance of Daubenton's bats is considered to be 'rarer' in Ireland.

6.32 Daubenton's bats are fast, agile bats, which typically forage over calm waterbodies within 6 km of roost sites (Dietz *et al*., 2009; Schofield & Mitchell-Jones, 2011). They are typically a tree dwelling species, favouring larger voids in trees rather than crevices (BTHK, 2018; Dietz et al., 2009). Daubenton's bats are also regularly recorded in bridges (BCI, 2010).

6.33 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst Daubenton's bat may use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.34 Daubenton's bat is a relatively common and widespread species that favours open water for feeding, which is a habitat that is poorly represented within the site. It is considered to be a species that is at low risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have low vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Whiskered bat (Myotis mystacinus)

6.35 Whiskered bats are widely distributed throughout Ireland. (McAney, 2006). The population is thought to be stable, and to comprise 5,000+ mature individuals (Marnell *et al*., 2009). The mammal red list for Ireland 2009 lists the species as of 'least concern' (Marnell *et al*., 2009). The relative abundance of whiskered bats is considered to be 'rarest' in Ireland.

6.36 Whiskered bats forage in a wide range of habitats including parkland, broadleaved and mixed woodland, wet woodland, gardens and along water courses, flying fast and close to vegetation (Dietz *et al*., 2009; Schofield & Mitchell-Jones, 2011). Most known summer roosts are in buildings, but they will roost in crevices in trees and bridges (Dietz et al., 2009; BCI, 2010; BTHK, 2018).

6.37 The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst whiskered bat may use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

6.38 Taking into account the results of bat monitoring, whiskered bat is a species that occurs infrequently within the site. It is a widespread species that is utilising the habitats within the site for foraging; however, as previously noted these habitats are widespread in the area. It is considered to be a species that is at low risk of turbine impact (see Table 3) and therefore within the Wind Farm this species is considered to have low vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

Lesser horseshoe bat (Rhinolophus hipposideros)

6.39 Lesser horseshoe bat *Rhinolophus hipposideros* is mainly found in counties in the west of Ireland: Mayo, Galway, Clare, Limerick, Kerry and Cork, although its strongholds are found in Kerry/west Cork and in Clare (Roche *et al*., 2015). The population in Ireland is thought to be stable and may be increasing (Roche *et al*., 2015). It is estimated at approximately 12,500 mature individuals (Marnell *et al*., 2009). The mammal red list for Ireland 2009 lists the species as of 'near threatened' in Ireland (Marnell *et al*., 2009). The relative abundance of lesser horseshoe bats is considered to be 'rarer' in Ireland.

6.40 Lesser horseshoe bats are typically associated with broadleaved woodland, and are agile flyers, foraging very close to vegetation (Dietz *et al*., 2009; Schofield & Mitchell-Jones, 2011). Summer roosts are predominately in buildings, and winter roosts in caves and mines (Dietz *et al*., 2009).

6.41 The closest known roost to Derrybrien Wind Farm Project is at Lough Cutra Castle (approximately 13.5 km to south-west). Collins (2016) describes Core Sustenance Zones (CSZ) for different bat species (based on extensive literature reviews): the core sustenance zone for lesser horseshoe bats is given as 2 km. Therefore, bats from the Lough Coutra roost are unlikely to commute to the Wind Farm to forage.

6.42 Taking into account the results of bat monitoring, there is no evidence that lesser horseshoe bat occurs within the site. The commercial plantation and open habitats at the site are widely available within the Slieve Aughty Mountains (local area). The condition and ratios of these habitats is variable locally. The elevation of the Wind Farm means it is more exposed than other areas in the Slieve Aughty Mountains. Whilst lesser horseshoe bat may use exposed upland sites, there is considerable similar habitat at lower, less exposed altitudes. Lower levels of activity are generally expected at these higher more exposed altitudes.

Consideration of Bat Species Vulnerability in relation to Article 12

6.43 A total of nine species of bat have been considered in this assessment, four of which are considered to have high vulnerability to impacts from wind turbines (common pipistrelle, soprano pipistrelle, Leisler's and Nathusius' pipistrelle; SNH *et al*., 2019), and five that have low vulnerability (brown long-eared, Natterer's, whiskered bat, Daubenton's bat and lesser horseshoe bat). As noted at paragraph 6.4 and in Table 3, the vulnerability of bat species to collision is based on physical and behavioural characteristics combined with evidence of casualty rates in Europe.

6.44 In relation to Article 12, the operation of a wind farm may be considered to result in 'deliberate disturbance' (Article 12(1)b) if vulnerable species are known to occur on a site and if the continued operation of the Wind Farm results in impacts on those species. Impacts may occur, for example, as a result of collision with turbine blades, barotrauma caused by passing close to a moving blade or displacement from commuting routes and feeding areas.

Evaluation of Vulnerability of Otter

6.45 The Irish otter population is reported to have remained largely stable and is regarded as a European stronghold (source: https://www.vincentwildlife.ie/species/otter). In Ireland otters are found in a diverse range of aquatic habitats, from small streams to major rivers, upland lakes to coastal lagoons and sandy beaches.

6.46 Otter is a wide ranging species and individuals that live in freshwater habitats can occupy very large home ranges (around 32 km for males and 20 km for females; source: https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/otter). According to O'Neill *et al*., (2008) (quoted in Reid *et al*., 2013), in Ireland, the territory of female otters in mesotrophic rivers (i.e. those with an intermediate level of productivity) is approximately 7.5 ± 1.5 km.

6.47 The size of a home range is likely to be dictated by prey availability as an otter is reported to eat around 1–1.5 kg of prey daily. Consequently it is expected that otter is an infrequent visitor to the Wind Farm as the small watercourses that are present are unlikely to provide significant feeding opportunities.

6.48 Taking into account the results of surveys carried out in 2003 and 2018, otter is considered to be a species that occurs infrequently within the site. It is a widespread species that is utilising the watercourses that drain the site for foraging; these watercourses extend outside the site forming an extensive network of suitable habitat for otter. It is considered to be a species that is at low risk of disturbance impact and therefore within the Wind Farm this species is considered to have low vulnerability to impacts on the conservation status of the local population as a result of the Wind Farm.

7 Assessment of Impacts on Bats

Construction Phase Impacts on Bats

Designated Sites

7.1 Lough Cutra SAC is poorly connected with the Wind Farm by habitats that are likely to be used by lesser horseshoe bats[6]. This conclusion is supported by the results of bat surveys carried out during the period 2011 to 2019, which found no evidence that lesser horseshoe bats use the Site. The assessment concluded that the construction phase impacts are not likely to have had a significant effect on the lesser horseshoe bat population of Lough Cutra SAC.

Lesser horseshoe bat, whiskered bat, and Daubenton's bat

7.2 The commercial plantation and open habitats available in the Derrybrien Wind Farm and associated works area are considered to be of negligible value to lesser horseshoe bat, whiskered bat and Daubenton's bat taking into account the specific ecological requirements of these species (Altringham, 2003; Dietz *et al*, 2009; Dietz & Kiefer, 2016).

7.3 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that lesser horseshoe bat has not been recorded within the site, and that whiskered bat and Daubenton's bat are infrequent visitors. These species are all considered to have low vulnerability with reference to the operational Wind Farm (see Section 6).

7.4 Any impacts that might have occurred due to construction activities may have had a negligible impact on lesser horseshoe bat, whiskered bat and Daubenton's bat. The net increase in open habitats is likely to have had a negligible impact on these species as these are sub-optimal foraging habitats. Overall the effects on lesser horseshoe bat, whiskered bat and Daubenton's bat populations in the local area are not considered to have been significant given the scale and duration of the impacts.

Brown long-eared bat

7.5 Taking into account the abundance of this species, as well as the exposure and altitude of the site, and the survey data, which indicates that there are low levels of brown long-eared bat activity within the site, the commercial plantation and open habitats available in the Derrybrien Wind Farm and associated works area are considered to be of value at the level of the site to brown long-eared bat. This evaluation takes into account the specific ecological requirements of this species (Swift, 1998; Altringham, 2003; Dietz et al, 2009; Dietz & Kiefer, 2016).

7.6 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that brown long-eared bat is an infrequent visitor to the site. This species is considered to have low vulnerability with reference to the operational Wind Farm (see Section 6).

7.7 Any impacts that might have occurred due to construction activities may have had a temporary minor negative impact on brown long-eared bats. The net increase in open habitats may have had a long term minor negative impact on this species as this species favours woodland and scrub habitats for feeding. The effects on brown long-eared bat populations in the local area are not considered to have been significant given the scale and duration of the impacts.

[6] The habitats along the Owendallulleegh River, which provides a link between the Wind Farm and Lough Cutra SAC, vary between open farmland and narrow strips of riparian woodland. The rest of the area between the SAC and the Wind Farm is a mixture of farmland, mixed aged coniferous plantation and cut over bog, all of which are sub-optimal habitats for lesser horseshoe bat.

Natterer's bat

7.8 Taking into account the abundance of this species, as well as the exposure and altitude of the site, and the survey data which indicates that there are low levels of natterer' bat activity within the site, the commercial plantation and open habitats available in the Derrybrien Wind Farm and associated works area are considered to be of value at no more than the local level. This evaluation takes into account the specific ecological requirements of this species (Altringham, 2007; Dietz et al, 2009; Dietz & Kiefer, 2016).

7.9 Information on the use of commercial coniferous plantation by bats is limited, with most roosting records coming from bat box studies and roost surveys of buildings within plantation areas. Mortimer (2006) conducted a study on the use of Tentsmuir Forest, a 9,143 hectare commercial coniferous plantation by Natterer's bats on the north-eastern coast of Fife, Scotland. The study found 22 natural tree roosts; of these 18 were in double-leadered Corsican pine *Pinus nigra*, three in woodpecker holes and one in a small cavity in a Scot's pine *Pinus sylvestris*.

7.10 Double-leadered trees are less favourable commercially than single-leadered trees, and are generally managed out of commercial plantations. In addition, woodpecker species were not recorded breeding in Ireland until 2007 (McDevitt *et al*., 2011). Therefore the availability of suitable roosting locations in conifer plantation on site is likely to have been low pre-construction, although the presence of roosting features in some trees cannot be ruled out.

7.11 The interface between coniferous woodland and open habitats such as blanket bog, as well as rides / tracks within the plantation will also have been suitable for use by foraging and commuting Natterer's bats.

7.12 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that natterer's bat is an infrequent visitor to the site. This species is considered to have low vulnerability with reference to the operational Wind Farm (see Section 6).

7.13 Any impacts that might have occurred due to construction activities may have had a temporary minor negative impact on Natterer's bats. The net increase in open habitats and plantation edge habitat may have had a long term minor positive impact on Natterer's bats. The effects on Natterer's bat populations in the local area are not considered to have been significant given the scale and duration of the impacts.

Nathusius' pipistrelle

7.14 The commercial plantation and open habitats available in the Derrybrien Wind Farm and associated works area are considered to have been of negligible value to Nathusius' pipistrelle taking into account the specific ecological requirements of this species (Altringham, 2007; Dietz et al, 2009; Dietz & Kiefer, 2016).

7.15 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that Nathusius' pipistrelle is an infrequent visitor to the site. This species is considered to have moderate vulnerability with reference to the operational Wind Farm (see Section 6).

7.16 Any impact that might have occurred due to construction activities may have had a temporary minor negative impact on Nathusius' pipistrelles. The net increase in open habitats / edge may have had a long term minor positive impact on Nathusius' pipistrelles. The effects on Nathusius' pipistrelle populations in the local area are not considered to have been significant given the scale and duration of the impacts.

Common and soprano pipistrelle

7.17 Taking into account the abundance of these species, as well as the exposure and altitude of the site, and the survey data (which indicates that these, as well as Leisler's bat, are the species that account for the highest levels of activity within the site), the commercial plantation and open habitats available in the Derrybrien Wind Farm and associated works area are considered to be of value at the level of the site to common pipistrelle and soprano pipistrelle bat. This evaluation takes into account the specific ecological requirements of this species (Altringham, 2007; Dietz et al, 2009; Dietz & Kiefer, 2016).

7.18 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that common and soprano pipistrelle bats are frequent visitors to the site. These species are considered to have high vulnerability with reference to the operational Wind Farm (see Section 6).

7.19 Any impact that might have occurred due to construction activities may have had a temporary minor negative impact on common and soprano pipistrelles. The net increase in open habitats and plantation edge habitat may have had a long term minor positive impact on common and soprano pipistrelles. The effects on common and soprano pipistrelles populations in the local area are not considered to have been significant given the scale and duration of the impacts.

Leisler's bat

7.20 Taking into account the abundance of this species, as well as the exposure and altitude of the site, and the survey data (which indicate that this species, as well as common pipistrelle and soprano pipistrelle bats, are the species that account for the highest levels of activity within the site), the commercial plantation and open habitats available in the Derrybrien Wind Farm and associated works area are considered to be of value at the level of the site to Leisler's bat. This evaluation takes into account the specific ecological requirements of this species (Altringham, 2007; Dietz et al, 2009; Dietz & Kiefer, 2016).

7.21 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that Leisler's bat is a frequent visitor to the site. This species is considered to have high vulnerability with reference to the operational Wind Farm (see Section 6).

7.22 Any impact that might have occurred due to construction activities may have had a temporary minor negative impact on Leisler's bat. The net increase in open habitats / edge may have had a long term minor positive impact on Leisler's bat. The effects on Leisler's bat populations in the local area are not considered to have been significant given the scale and duration of the impacts.

Operation Phase Impacts on Bats (Peat Slide)

Impact of the peat slide on protected sites

7.23 Separate assessment (rNIS) has concluded that the Derrybrien Wind Farm and associated peat slide are not likely to have had a significant effect on Lough Cutra SAC. This conclusion has been reached with reference to both direct and indirect impacts on the SAC qualifying feature (lesser horseshoe bats). Survey has concluded that it is unlikely that the peat slide had a significant effect on the invertebrates that lesser horseshoe bats feed on.

Impact of the peat slide on bats

7.24 It has been estimated (ESB, 2020) that the peat slide resulted in the loss of approximately 25 ha of coniferous woodland (some of which had to be felled due to the slide) and damage to three bridges. This in turn may have resulted in the disturbance and displacement of bats, the temporary loss of habitats for bats and the permanent loss of roosting opportunities for bats. The absence of data for the period prior to the peat slide means that impacts could not be confirmed. Overall the peat slide resulted in an increase in the amount of open habitat available, resulting in a net increase of approximately 25 ha of open habitat.

7.25 Habitats that were within the area of offsite peat slide works are considered to have had negligible value to lesser horseshoe bats, whiskered bats, Daubenton's bats, brown long-eared bats, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and Leisler's bat. This conclusion has been reached taking into account the specific ecological requirements of these species (Altringham, 2007; Dietz et al, 2009; Dietz & Kiefer, 2016). The availability of suitable roosting locations for natterer's bat in the conifer plantation is likely to have been low pre-peat slide, but the presence of roosting features in some trees cannot be ruled out.

7.26 Offsite peat slide works resulted in damage to three bridges that may have had roosting potential for bats (as a result of the repair of the bridges). Daubenton's bats, common pipistrelle, soprano pipistrelle, brown long-eared bat and Natterer's bat are all species that might exploit roosting opportunities in bridges, although the bridges have been assessed as only having the potential to support low numbers of bats (Chapter 7 Biodiversity, Remedial Environmental Impact Assessment Report: ESB, 2020). It has been noted that masonry bridges are common within the local landscape (Chapter 7 Biodiversity, Remedial Environmental Impact Assessment Report: ESB, 2020). Overall the loss of potential roost features in the affected bridges may have had a permanent minor negative impact on one or more of these species.

Operation Phase Impacts on Bats: 2006 - 2020

Direct Impacts

7.27 There has been very little additional habitat loss during the operational phase from 2006 to 2020. Minor localised road widening works were undertaken in 2014 at a small number of locations. These road widening works would have resulted in minor direct habitat loss of cutover bog and felled forestry habitat, which in turn may have had a minor negative effect on foraging and commuting bats.

7.28 Occasional cutting back of re-growth of trees within the felled forestry areas prevents canopy closure occurring. As a result, the dominant heath / bog vegetation continues to occupy these areas. This work may have had a minor negative effect on foraging and commuting bats (as it will prevent succession into more structured habitats that may provide better foraging opportunities).

Indirect Impacts

7.29 The potential impact of operational wind farms on bats is fatality caused by interaction with wind turbines. Studies (Dürr & Bach, 2004) have led to the conclusion that some bat species are at higher risk of collision with wind turbines due to their ecology. Guidance (SNH *et al*., 2019) suggests that common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and Leisler's bat, all of which have been recorded within the Wind Farm site, are at higher risk of turbine collision.

7.30 Since 2002, the State Bird Conservation Authority of the Brandenburg State Office for the Environment has been collecting available data on collisions between birds and bats on wind turbines in Europe (Dürr, 2019). No published data are available on bat fatalities recorded at wind farms in Ireland, but 133 fatalities have been recorded at UK wind farms (and passed on to the recording centre). A summary of the data from UK and Europe (total) for high risk species recorded in Ireland are given in Table 4.

Table 4: Summary of bat fatalities (high risk species) at wind turbines in the UK and Europe (total including UK figure).

Bat species	UK	Europe
Nathusius' pipistrelle	1	1,564
Common pipistrelle	46	2,362
Soprano pipistrelle	52	439
Leisler's bat	0	711

7.31 One soprano pipistrelle corpse was found during mortality surveys at Derrybrien Wind Farm, confirming that bat mortality has occurred during the site's operation phase. The dead bat was found during a search at 6 turbine locations (T11, T17, T18, T21, T27, and T71) on two occasions in August and September 2016.

7.32 Monitoring studies at other operational wind farm sites have demonstrated fatality rate differences between years. These fatality rates do not always correspond with the bat activity data recorded pre-construction and post-construction. It is therefore difficult to accurately predict future fatalities based on historic data. For this reason a precautionary approach has been taken when assessing the significance of effects on bat populations in the project area.

Lesser horseshoe bat, whiskered bat, Daubenton's bat, Natterer's bat and brown long-eared bat

7.33 Lesser horseshoe bat, whiskered bat, Daubenton's bat, Natterer's bat and brown long-eared bats are considered to be at low risk of collision with turbines due to their foraging and commuting behaviours (SNH *et al*., 2019). For this reason no significant negative effects on lesser horseshoe bat, whiskered bat, Daubenton's bat, Natterer's bat and brown long-eared bat populations are considered likely to have occurred during the operation phase.

7.34 The results of desk study, survey in 2011 (report published in 2012) and monitoring in 2016 and 2019 indicate that lesser horseshoe bat has not been recorded within the site and whiskered bat and Daubenton's bat are infrequent visitors. These species are all considered to have low vulnerability with reference to the operational Wind Farm (see Section 6).

Nathusius' pipistrelle

7.35 A relatively small number of calls that could have been Nathusius' pipistrelle were recorded in 2016 but the presence of this species could not be confirmed due to the characteristics of the calls. This species was recorded at the site on two nights in autumn 2019 (6 passes in three minutes on 11/09/2019 and 1 pass on 07/09/2019). The autumn period was monitored for the first time in 2019 and so it is not possible to infer seasonal behaviour variability for this species from the available data; however, the recorded activity may have been bats on autumn migration.

7.36 Based on the data collected it is possible that Nathusius' pipistrelle is an infrequent visitor to the site. On the basis of the data collected to date, and adopting a precautionary approach, it is assumed that Nathusius' pipistrelles may have been present throughout the operation phase but that activity levels were low.

7.37 The autumn activity recorded for Nathusius' pipistrelle within the site may be consistent with natural dispersal (after the summer breeding period) and migratory patterns as recorded across Europe (Dietz & Keifer, 2016; Dürr and Bach, 2004) found that the majority of all bat fatalities (89%) occurs during the autumn.

7.38 Nathusius' pipistrelle is considered to be at high risk of collision with turbines due to their foraging and commuting behaviours and the evidence of fatalities for the species at monitored wind farms across Europe (and therefore assumed Ireland). The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that Nathusius' pipistrelle is an infrequent visitor to the site. This species is considered to have moderate vulnerability with reference to the operational Wind Farm (see Section 6).

7.39 It is possible that a long term negative impact of unknown significance on Nathusius' pipistrelle bats has occurred at the site level between 2006 and 2020.

7.40 Nathusius' pipistrelle is described as being 'rarest' in relation to the relative abundance of the species in Ireland: it has not been recorded breeding in Ireland to date. The levels of activity recorded within the site suggest that low numbers of Nathusius' pipistrelle pass through the areas around the turbines. Given the indicative size of the population in Ireland (Bat Conservation Ireland, 2019; Marnell et al., 2009), a precautionary assessment is that the effect of mortality may have had a long term negative effect of unknown significance.

Common and soprano pipistrelle

7.41 Common and soprano pipistrelle bats were recorded on site during monitoring completed in 2016 and 2019. Although comprehensive data were not collected prior to 2016, survey in 2012 confirmed that pipistrelle bats were present on site at that time. It is therefore reasonable to assume that common and/or soprano pipistrelle bats have been present throughout the operation phase of the Wind Farm.

7.42 In 2016, common pipistrelles were recorded during every month of survey. There was a peak in activity in June (4.5 P/h), and relatively low activity in April, May, July and August (0.4, 0.1, 0.1 and 0.4 P/h respectively). Soprano pipistrelles were also recorded during every month of survey. There was a similar peak in activity in June (0.6 P/h), and far lower activity in April, May, July and August (all <0.1 P/h). Given that a peak in activity only occurred in June for both species, it is considered most likely that the bats were responding to a period of high invertebrate food availability and/or calm weather.

7.43 The highest activity was recorded from 101-120 mins after sunset for both common and soprano pipistrelle; the lowest activity was recorded within the 40 minutes after sunset and before sunrise (<0.1 P/h both species). Both common and soprano pipistrelles are early emerging and late returning species, therefore the temporal data suggests that there are no large roosts of either species in close proximity to the site.

7.44 Common and soprano pipistrelle activity during the autumn of 2019 (29 August to 3 October 2019 inclusive) was lower than recorded in June 2016 for common pipistrelle (2.4 P/h) but slightly higher for soprano pipistrelle (0.8 P/h). Low activity was recorded within the 40 minutes after sunset and before sunrise for common and soprano pipistrelle (0.2 and 0.1 P/h respectively), suggesting a similar temporal pattern to that recorded in 2016.

7.45 Both species are considered to be at high risk of collision with turbines due to their foraging and commuting behaviours and the evidence of fatalities for both species at wind farm sites across the UK and Europe. The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that common and soprano pipistrelle bats are frequent visitors to the site. These species are considered to have high vulnerability with reference to the operational Wind Farm (see Section 6).

7.46 During the operational period of the Wind Farm it is possible that there may have been bat mortality due to wind turbines. The effect of mortality on the favourable conservation status of common and soprano pipistrelle bat populations may have been negative and long term but of unknown significance.

Leisler's bat

7.47 Leisler's bat was recorded on site during 2016 and 2019. In 2016, an average activity rate was recorded of Leisler's bats of 3 bat passes per hour (P/h) between April and August. Leisler's bats were recorded during every month of survey. There was a peak in activity in April and May (7.0 and 6.2 P/h respectively, which coincides with the end of the hibernation period as bats start to move to their summer roosts), and a marked decrease in activity during the bat maternity season in June, July and August (0.9, 0.3 and 0.2 P/h).

7.48 Low activity was recorded within the periods 20 minutes after sunset and before sunrise (<0.1 and 0.2 P/h respectively). Thirty-three Leisler's bat passes were recorded before sunset (7 bat passes) or after sunrise (26 bat passes). Early / late bat passes were recorded at T27, T67 T18 and T41 over nine separate nights. This temporal pattern suggests that it is unlikely that there was a permanent roost in or close to the Wind Farm during the recording period, but that individual bats may have opportunistically roosted nearby on a few occasions.

7.49 Leisler's bat activity during the autumn of 2019 (29 August to 3 October inclusive), was lower than recorded in spring 2016, and similar to the activity recorded in summer of the same year (average in autumn 2019 0.6 P/h). A similar pattern of activity was noted compared to that recorded in 2016.

7.50 Leisler's bat is considered to be at high risk of collision with turbines due to its foraging and commuting behaviours and the evidence of fatalities for the species at wind farms across Europe. No Leisler's bat fatalities have been recorded in the UK; however, there have been noctule fatalities recorded (11 bats), which is the more common *Nyctalus* sp. in the UK. It is reasonable to assume that Leisler's bats have been present throughout the operation phase.

7.51 The results of desk study, survey in 2012 and monitoring in 2016 and 2019 indicate that Leisler's bat is a frequent visitor to the site. This species is considered to have high vulnerability with reference to the operational Wind Farm (see Section 6).

7.52 It is possible that a negative impact on Leisler's bats has occurred over the operational period of the Wind Farm that is significant at a site level.

7.53 The habitats at Derrybrien Wind Farm were considered to be of local value to Leisler's bat. The relative abundance of Leisler's in Ireland is 'rarer'; however, monitoring data suggest populations in Ireland are stable.

7.54 During the operational period of the Wind Farm it is possible that there may have been bat mortality due to wind turbines. The effect of mortality on the favourable conservation status of Leisler's bat populations may have been negative and long term but of unknown significance.

Operation Phase Impacts on Bats: Future Impacts

Direct Impacts

7.55 The Derrybrien Wind Farm is expected to operate until circa 2040. During that period, the site will be maintained as it has been since commencement of operation, with repairs to roads and other infrastructure as required. Self-seeded conifers will be controlled as necessary within the Wind Farm site and along the overhead line corridor so that the vegetation will continue to be dominated by low growing heath / bog and low scrub species. This management is only likely to have a minor negative effect on foraging and commuting bats.

Indirect Impacts

7.56 The same species assemblage has been recorded in 2016 and 2019, with the exception of Nathusius' pipistrelle which has only been recorded in 2019. This result needs to be treated with caution as Nathusius' pipistrelle was only recorded on two nights in September 2019, which may have been bats on autumn migration. The survey in 2016 only covered the period April to August and so may have missed any autumn migration.

7.57 The impacts and effects that are likely to occur until the end of the operational phase are considered to be the same as those that have occurred and are currently occurring.

Decommissioning Phase Impacts on Bats

Direct Impacts

7.58 The decommissioning phase will involve the removal of turbines and other site infrastructure. The access roads and hard-standing areas will remain in-situ. Most works associated with the decommissioning of the Wind Farm will be undertaken from hard-standing areas and therefore direct impacts on semi-natural habitats are unlikely to occur. There may be minor localised disturbance impacts on semi-natural habitats from some decommissioning activities. The proposed works are only likely to have a minor negative effect on foraging and commuting bats.

Indirect Impacts

7.59 It is assumed that the species assemblage will broadly be the same in the decommissioning phase as has previously been recorded in 2016 and 2019 (although it is acknowledged that it is difficult to predict long-term effects on local populations and future population trends are unknown). The impacts and effects which are likely to occur in the decommissioning phase are considered to be the same as those that have occurred during the construction phase.

Cumulative Impacts

7.60 The following developments and projects in proximity to the Wind Farm project have been considered in the assessment of cumulative impacts:

- Adjacent coniferous forestry plantations
- Moneypoint-Oldstreet 400kV Line
- Ennis- Shannonbridge110kV Line
- Gort Water Supply
- Local OPW Flood Relief Scheme Gort
- Local Flood Relief Works at Kiltartan
- Flood Relief Works at Kinvara
- Proposed Gort Lowlands Flood Relief Scheme
- M18 motorway project
- Coillte Quarry
- Sand Extraction at Cloghvoley

7.61 The Sonnagh Old Wind Farm is the only other operational wind farm within the Slieve Aughty Mountains SPA. Information on the predicted ecological effects of Sonnagh Old Wind Farm was available and did not include any significant effects on bats. The surveys completed and the information provided on bats in the EIS chapters is very limited. Due to these data limitations it is not possible to assess whether significant cumulative impacts are likely to have occurred during the construction phase.

7.62 As a consequence of the lack of historic baseline information collected for the Sonnagh Old Wind Farm, the extent to which bats are being affected by the Wind Farm is not currently known, and hence it cannot be ruled out that there might be a cumulative effect with the Derrybrien Wind Farm. Further monitoring is required in order to confirm that the mitigation proposed will ensure that there is no deliberate disturbance of bats at the Derrybrien Wind Farm.

7.63 Sonnagh Old Wind Farm is a 9 turbine development. The number of turbines increases the potential for bat fatalities due to interaction with wind turbines in the local area. Sonnagh Old Wind Farm is located in similar upland habitats to the Derrybrien Wind Farm and therefore it is assumed that this site is likely to support the same assemblage of bats. A precautionary approach has been adopted whereby it has been assumed that the same significant effects on bats would be occurring at the Sonnagh Old Wind Farm in order to assess the cumulative impact.

Lesser horseshoe bat, whiskered bat, Daubenton's bat, Natterer's bat and brown long-eared bat

7.64 No impacts are predicted on lesser horseshoe bat, whiskered bat, Daubenton's bat, Natterer's bat and brown long-eared bat populations during the operation phase of the Derrybrien Wind Farm. It therefore follows that no impacts are predicted for the operation phase of the Sonnagh Old Wind Farm and therefore no cumulative impacts are predicted.

Common pipistrelle, soprano pipistrelle and Leisler's bat

7.65 Long term negative effects significant at the site level may occur at Derrybrien Wind Farm as a result of the operation of the Wind Farm through the potential for a small number of common pipistrelle, soprano pipistrelle and Leisler's bats to be killed by the wind turbines.

7.66 A precautionary assessment is that the cumulative effect of the additional wind farm would be a long term negative effect the significance of which is unknown.

Nathusius' pipistrelle

7.67 Long term negative effects significant at the county level may occur at Derrybrien Wind Farm as a result of the operation of the Wind Farm through the potential for a small number of Nathusius' pipistrelle bats to be killed by the wind turbines. This assessment is based on very limited information on Nathusius' pipistrelle populations in Ireland.

7.68 A precautionary assessment is that the cumulative effect of the additional wind farm would be a long term negative effect the significance of which is unknown.

The Requirement for Mitigation Measures

7.69 Article 12 of the Habitats Directive requires that Member States shall implement measures to prohibit all forms of deliberate killing of bats in the wild (Article 12(1)), and to establish a system to monitor the incidental killing of bats (Article 12(4)). Member States are also required to implement conservation measures to ensure that incidental killing does not have a significant negative impact on bats.

7.70 In Section 2.11 it is noted that a UK High Court Judgment in 2012 provided some clarity regarding the issue of 'deliberate' killing of birds and bats at windfarms (Eaton V. Natural England And RWE Npower Renewables Ltd [1012] EWHC2401). In this case the Judge concluded that "*the expression 'incidental killing' cannot be confined to the case of a one-off accident*" where there would clearly not be an offence, and noted that the particular activities included under Article 12(1) would include those where "*killing may occur from time to time*". In other words there is a range, from a one-off accident that is clearly incidental killing, through to deliberate targeting of protected species, which would be considered an offence under Article 12 1(a).

7.71 The occasional killing of a bat may not constitute an offence under Regulation 51(2) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) if the favourable conservation status of the species is not affected at the local level. To determine whether or not this is the case a monitoring system will need to be implemented, as required under Regulation 51(4) of the Regulations 2011 (Article 12(4) of the Habitats Directive).

Proposed Mitigation and Monitoring Strategy

7.72 During a trial bat carcass search using dogs, undertaken over a two day period in 2016, a dead bat was recorded at the Derrybrien Wind Farm, demonstrating that bat fatality occurs at the site.

7.73 Monitoring studies at other operational wind farm sites have demonstrated between year and between season differences in fatality rates. As many of these operational sites are in upland habitats with typically low levels of bat use, these differences appear likely to relate to whether seasonal sampling periods coincide with warm, settled weather and the availability of insect prey.

7.74 Available guidance on the reduction of fatalities at wind farms sites states:

7.75 '*In order to minimise down time, the threshold values at which turbines are feathered should be site specific and informed by bat activity peaks at that location, but as an indication, they are likely to be in the range of wind speeds between 5.0 and 6.5 m/s and at temperatures above approximately 10 or 11ºC measured at the nacelle. Significant savings can be achieved by so-called "smart" curtailment over the other less sophisticated alternatives*.' (SNH *et al*., 2019)

7.76 As a full survey season of bat activity data with paired weather data is not currently available, but a risk of significant fatalities for some bat species has been identified, a blanket curtailment scheme with the following cut off parameters will be implemented at all turbines in August 2020. The curtailment scheme will be in effect April to October (inclusive), it will stop the operation of turbines when temperatures are above 11 degrees Celsius and wind speed is below 5 m/s between dusk and dawn each night.

7.77 A central met mast will measure weather conditions and curtailment will be triggered when all thresholds are met.

7.78 To determine whether mitigation to reduce fatality levels is appropriate fatality monitoring during the spring, summer and autumn of each year will be completed for a minimum of three years commencing in August 2020. This will involve:

- Collection of bat activity, fatality and site-specific weather data in each of the three seasons. A proportion (32 of the 70 turbines) will be subject to monitoring using specially trained search dogs.
- Collection of site-specific data on seasonal scavenger removal rates and on the efficiency of detection of animal carcasses by the dogs used for bat searching.
- Modelling / calculation of the level of bat fatality likely to occur over the active season based on the results of the work.
- The production of an annual report detailing the approach to, results and conclusions of the work. Statistical analysis of the relationship between weather and fatality levels will be included. The report will be issued to NPWS and the Determining Authority.
- Discussion of the results of the monitoring with the determining authority (ideally involving NPWS), to determine an appropriate way forward. This will include a review of the adequacy of the monitoring effort (in light of the results) and discussion of whether turbine curtailment parameters should be varied based on any fatalities, activity and weather conditions recorded. Any variations to the mitigation will be monitored to confirm the mitigation is effective.

7.79 The damage of three bridges due to the peat slide in 2003 may have resulted in the loss of potential roosting features for bats. Bat Conservation Ireland provides guidance for planners, engineers and developers on appropriate mitigation for the loss of roosting opportunities in bridges (BCI, 2010). In line with this guidance a minimum of two bat boxes will be fixed to each of the three bridges that were affected by the peat slide. If suitable locations for the bat boxes cannot be found on the bridges, they will be placed on nearby trees at a suitable aspect.

Residual Impacts

Natterer's bat, Daubenton's bat, and brown long-eared bat

7.80 The loss of potential roost features at bridges affected by the peat slide resulted in a permanent negative impact significant at the site level. Mitigation for the loss of potential roost features by providing suitable bat boxes at the bridges will result in a permanent positive residual significant effect at the site level.

Nathusius' pipistrelle

7.81 During the operational phase of the project it is possible that some fatality has occurred to date as a result of blade strike. A precautionary assessment is that the effects of fatality at the wind farm and in combination with other projects may have resulted in a residual long term negative effect on Nathusius' pipistrelle that is significant at the County level.

7.82 Once mitigation is implemented during August 2020 the potential to affect the (local) favourable conservation status of Nathusius' pipistrelle will be reduced. It is considered likely that with mitigation in place there will be no significant residual effect at the wind farm or in combination with other projects on Nathusius' pipistrelle populations at any geographical level. This conclusion will be confirmed during the three years of monitoring post implementation.

Common pipistrelle

7.83 The loss of potential roost features at bridges impacted by the peat slide resulted in a permanent negative impact but was not considered to be significant. Mitigation for the loss of potential roost features by providing suitable bat boxes at the bridges will result in a permanent positive residual significant effect at the site level.

7.84 During the operational phase of the project it is likely that some fatality has occurred to date as a result of blade strike. A precautionary assessment is that the cumulative effects of fatality alone and in combination with other projects may have resulted in a residual long term negative effect on common pipistrelle that is significant at the local level.

7.85 Once mitigation is implemented during August 2020 the potential to affect the (local) favourable conservation status of common pipistrelle will be reduced. It is considered likely that with mitigation in place there will be no significant residual effect at the wind farm or in combination with other projects on common pipistrelle populations at any geographical level. This conclusion will be confirmed during the three years of monitoring post implementation.

Soprano pipistrelle

7.86 The loss of potential roost features at bridges impacted by the peat slide resulted in a permanent negative impact but this was not considered to be significant. Mitigation for the loss of potential roost features by providing suitable bat boxes at the bridges will result in a permanent positive residual significant effect at the site level.

7.87 During the operational phase of the project it is likely that some fatality has occurred to date as a result of blade strike. A precautionary assessment is that the cumulative effects of fatality alone and in combination with other projects may have resulted in a residual long term negative effect on soprano pipistrelle that is significant at the local level.

7.88 Once mitigation is implemented during August 2020 the potential to affect the (local) favourable conservation status of soprano pipistrelle will be reduced. It is considered likely that with mitigation in place there will be no significant residual effect at the wind farm or in combination with other projects on soprano pipistrelle populations at any geographical level. This conclusion will be confirmed during the three years of monitoring post implementation.

Leisler's bat

7.89 During the operational phase of the project it is likely that some fatality has occurred to date as a result of blade strike. A precautionary assessment is that the cumulative effects of fatality alone and in combination with other projects may have resulted in a residual long term negative effect on Leisler's bat that is significant at the local level.

7.90 Once mitigation is implemented during August 2020 the potential to affect the (local) favourable conservation status of Leisler's bat will be reduced. It is considered likely that with mitigation in place there will be no significant residual effect at the wind farm or in combination with other projects on Leisler's bat populations at any geographical level. This conclusion will be confirmed during the three years of monitoring post implementation.

8 Assessment of Impacts on Otter

Construction Phase Impacts on Otter

Designated Sites

8.1 There are no European sites where otter is a qualifying feature that will be impacted by the Wind Farm.

Otter within the Wind Farm

8.2 Survey carried out in 2003 found signs of otter presence (tracks and spraint) the distribution of which indicate that otter use all of the main channels of the 3 main catchments and likely also use substantial proportions of all of the side tributaries for feeding and marking. No evidence was found that otter breeds on the Owendalulleegh River downstream of Flaggy Bridge.

8.3 It is likely that natal holts were absent from the site at that time based on assessment of habitat suitability and prey availability; however, it has not been possible to confirm whether this is correct. Whilst the location of natal holts will be dictated in part by habitat availability (i.e. suitable habitat that provides a place of rest and shelter), the availability of food is also likely to be an important factor (as adult female otters and their cubs will need a regular source of food). Natal holts are therefore considered more likely situated in the more productive parts of the system, i.e. within the main river valley closer to the best feeding, rather than in the upper parts of tributaries where food resources would be lower (rEIAR, Chapter 7, Section 7.4.2.2.4, Mammals - Otter). Overall it is considered unlikely that otter would have been subject to significant disturbance during the construction phase of the development.

8.4 The commercial plantation and open habitats within the Derrybrien Wind Farm and associated works area are considered to be of negligible value to otter, although it is noted that otter may select suitable holt sites some distance from a watercourse (Chanin, 2003).

Construction Phase Impacts on Otter (Peat Slide)

Impact of the peat slide on protected sites

8.5 There are no European sites where otter is a qualifying feature that will be impacted by the Wind Farm.

Impact of the peat slide on otter

8.6 It has been estimated (ESB, 2020) that the peat slide resulted in the loss of approximately 25 ha of coniferous woodland (some of which had to be felled due to the slide) and damage to three bridges. Whilst this is unlikely to have impacted directly on otter (as the habitat has low suitability for the establishment of couches and holts, including natal holts), it may have resulted in the disturbance and displacement of otter, and the temporary loss of habitats used by resting otter and temporary impacts on aquatic populations (e.g. fish and amphibians) that may have been exploited by feeding otter (there was a short-term profound impact on the fishery as a result of the peat slide). The absence of data for the period prior to the peat slide means that impacts could not be confirmed.

8.7 Habitats that were within the area of offsite peat slide works are considered to have had negligible value to otter. Offsite peat slide works resulted in damage to three bridges but survey has not highlighted either of these structures as having suitability for otter (rEIAR, Chapter 7, Otter Assessment).

8.8 No signs of otter were recorded during a survey of the Wind Farm site in summer 2018, which was not considered to be surprising given that there are no fish-bearing streams on the site (rEIAR, Chapter 7, Otter Assessment). It was considered possible that otter may forage for frogs in and around the Wind Farm site in late winter early spring (rEIAR, Chapter 7, Otter Assessment). Overall it was considered unlikely that foraging otter would have been significantly impacted by on-site activity during the construction period, given that otter generally feed at dawn and dusk (Carrs, 1995).

8.9 As no otter surveys were undertaken as part of the original EISs, it is not known how many otters were present along the Owendalulleegh River or its tributaries, or where in the system they had holts or resting places. A separate assessment (rEIAR, Chapter 7, Otter Assessment) has speculated that there might have been 2 females with cubs within the overall Owendalulleegh system, and possibly another one close to or around Lough Cutra.

8.10 Natal holts where the females raise cubs would be more likely situated in the more productive parts of the system, i.e. within the main river valley closer to the best feeding, rather than in the upper parts of tributaries where food resources would be lower.

8.11 The assessment (rEIAR, Chapter 7, Otter Assessment) also concluded that females and their cubs within the Owendalulleegh catchment were more likely to be concentrated toward the middle to lower reaches of the main channel. In those locations they would have likely avoided any risk of direct mortality from the peat slide. Adults and subadult males, being more mobile, would probably have been able to avoid any direct mortality from the peat slide if they were present in the area at the time. It is concluded therefore that the slide was very unlikely to have caused the direct mortality of any otters (rEIAR, Chapter 7, Otter Assessment).

8.12 Otter footprints recorded 2 months after the peat slide in December 2003 confirmed that otters were still active in the Owendalulleegh River, including in the lower reaches of the impacted tributary. It was considered likely that otter would have been active in the lower reaches of the Owendalulleegh River as well (rEIAR, Chapter 7, Otter Assessment).

8.13 While the 2003 peat slide in Derrybrien resulted in a large fish kill in the Owendalulleegh River, some fish may well have survived in the lower reaches of the river (rEIAR, Chapter 7, Otter Assessment). In addition, all fish in the main channel of the river upstream of the confluence of the affected tributary and in the smaller side tributaries would also have survived. Thus, while the fish component of the diet of the otter in the Owendalulleegh catchment area would have been reduced, some fish would certainly have been available within normal foraging distances of any otter present (this species is known to travel long distances to feed).

8.14 Following the peat slide it is possible that otter in the area fed on recently dead fish, but may also have been able to shift their diet to alternative foods sources, such as amphibians. It has been postulated that for a few months after the peat slide, food resources may have been reduced for otter and that the affected animals would have had to travel farther to find adequate fish food and possibly to have shifted their diet more to non-fish prey types (rEIAR, Chapter 7, Otter Assessment).

8.15 A reduction in food may have affected adult female otters with litters, which in turn may have resulted in a reduction in the number of otter cubs in the local population as a result of a reduced survival rate (rEIAR, Chapter 7, Otter Assessment). Such an effect, had it occurred, would have lessened in each successive year as fish numbers recovered. This impact on cubs, had it occurred, would have been short-term in duration but may not have had a significant effect on the adult population: research in Shetland (Kruuk *et al*., 1991) has noted that, despite a large variability in annual recruitment, the adult otter population in the same area remained stable.

8.16 The results of fish surveys (rEIAR, Chapter 8, Section 8.2.6.2, Findings of Fisheries Surveys) show that trout densities on the Owendalulleegh have consistently been higher in the main channel than in any of the small tributaries surveyed in the same catchment. Furthermore, the recorded densities are the same as or higher that those recorded at sites in the lower reaches of the river, suggesting that in the past decade at least overall fish production in the system has been quite stable. The data also show that the densities of fish encountered in the channel upstream of the tributary impacted by the slide are at least as high as those at sites downstream of the confluence. Throughout the main channel trout densities appear to be fairly similar.

8.17 No impacts on otter would have occurred in either the Boleyneendorrish or Duniry catchments as they were not impacted by the peat slide.

Operation Phase Impacts on Otter

Direct Impacts

8.18 There has been very little additional habitat loss during the operational phase from 2006 to 2020. Minor localised road widening works were undertaken in 2014 at a small number of locations. These road widening works would have resulted in minor direct habitat loss of cutover bog and felled forestry habitat, which were unlikely to be used by otter.

8.19 Occasional cutting back of re-growth of trees takes place within the felled forestry areas, thereby maintaining the dominant heath / bog vegetation. This work is unlikely to have impacted on otter.

Indirect Impacts

8.20 There is increasing evidence that otter can become habituated to development, with many of records of otter being present in cities, at ports, in busy estuaries etc (Chanin, 2003). In the Wind Farm all of the wind turbines are set back from watercourses, which will further mitigate disturbance impacts from an operational wind turbine. Maintenance visits are infrequent and will be focussed on wind turbine locations, which will be accessed using the existing network of tracks. Consequently disturbance from operating wind turbines, maintenance staff and vehicles is considered to be unlikely during the operational phase.

8.21 A separate assessment (rEIAR, Chapter 7, Otter Assessment) observes that within the area affected by the peat slide, full trout biomass would likely have been restored in 3-5 years, with stone loach biomass being restored even sooner. These changes would have restored prey availability for otter in the Owendalulleegh system, coinciding largely with the commissioning of the Wind Farm in 2006. After that time and up to the present, the operation of the Wind Farm is not believed to have had any significant negative impact on fish biomass within the Owendalulleegh catchment or any other river catchment draining the Project area and therefore no negative impact on the food availability of otter (rEIAR, Chapter 7, Otter Assessment).

Operation Phase Impacts on Otter: Future Impacts

Direct Impacts

8.22 The Derrybrien Wind Farm is expected to operate until circa 2040. During that period, the site will be maintained as it has been since commencement of operation, with repairs to roads and other infrastructure as required. Self-seeded conifers will be controlled as necessary within the Wind Farm site and along the overhead line corridor so that the vegetation will continue to be dominated by low growing heath / bog and low scrub species. This management is unlikely to have an effect on otter.

8.23 An assessment of water quality impacts associated with on-going operation of the Derrybrien Wind Farm (rEIAR, Chapter 7, Otter Assessment) has only predicted slight localised reductions in water quality associated with drain cleaning, but none that would cause a reduction in fish biomass overall. For these reasons the operation of the Wind Farm until the end of its operating life will have no negative impact on otters.

Indirect Impacts

8.24 The impacts and effects that are likely to occur until the end of the operational phase are considered to be the same as those that have occurred and are currently occurring.

Decommissioning Phase Impacts on Otter

Direct Impacts

8.25 The decommissioning phase will involve the removal of turbines and other site infrastructure. The access roads and hard-standing areas will remain in-situ. Most works associated with the decommissioning of wind farm infrastructure will be undertaken from hard-standing areas and therefore direct impacts on watercourses are unlikely to occur.

8.26 There may be minor localised disturbance impacts at watercourse crossings resulting from some decommissioning activities; however, this will only be at one or two locations as most infrastructure is set back from watercourses.

8.27 The removal of the post-slide remedial structures, namely Barrages 3 and 4, from the Owendalulleegh River will result in temporary disturbance of watercourse habitats. As otter are primarily nocturnal these activities are not likely to have a significant effect on the local population as the work will take place during daylight hours.

Indirect Impacts

8.28 It is assumed that the otter presence and distribution will broadly be the same in the decommissioning phase as has previously been recorded in 2003 and 2018 (although it is acknowledged that it is difficult to predict long-term effects on local populations and future population trends are unknown). The impacts and effects which are likely to occur in the decommissioning phase are considered to be the same as those that have occurred and are currently occurring.

8.29 The strategy proposed for the decommissioning phase of the project is one of minimal ground disturbance in order to avoid generating suspended solids wash-out (rEIAR, Chapter 7, Otter Assessment). For this reason, no negative impact is anticipated to affect the fish populations of the 3 main catchments draining the site, and therefore no negative impact on otter is anticipated. While intermittent localised disturbance may impact a small number of foraging otter in the winter-spring period while foraging, this is expected to have at most a slight, negative and temporary impact.

Cumulative Impacts

8.30 The following developments and projects in proximity to the Wind Farm project have been considered in the assessment of cumulative impacts:

- Adjacent coniferous forestry plantations
- Moneypoint-Oldstreet 400kV Line
- Ennis- Shannonbridge110kV Line
- Gort Water Supply
- Local OPW Flood Relief Scheme Gort
- Local Flood Relief Works at Kiltartan
- Flood Relief Works at Kinvara
- Proposed Gort Lowlands Flood Relief Scheme
- M18 motorway project
- Coillte Quarry
- Sand Extraction at Cloghvoley

8.31 Information on the predicted ecological effects of Sonnagh Old Wind Farm was available and did not include any significant effects on otter. The surveys completed and the information provided on otter in the EIS chapters is very limited. Due to these data limitations it is not possible to assess whether significant cumulative impacts are likely to have occurred during the construction phase.

8.32 As a consequence of the lack of historic baseline information collected for the Sonnagh Old Wind Farm, it is not known if otter is being affected by the Wind Farm, and hence whether there might be a cumulative effect with the Derrybrien Wind Farm. Professional judgment has been used to determine whether otter is likely to be affected based on knowledge of species behaviour and ecological requirements.

8.33 Sonnagh Old Wind Farm is a 9 turbine development located in similar upland habitats to the Derrybrien Wind Farm and therefore it is assumed that this site is likely to support a similar otter population. It is considered that there is not likely to be significant use of the Derrybrien Wind Farm by otter and that there are unlikely to be significant impacts on otter during the different development phases. Hence it is also concluded that a cumulative impact with Sonnagh Old Wind Farm is unlikely as a similar range and magnitude of impacts is predicted.

8.34 The projects listed above are deemed to have at most resulted in slight, temporary and localised negative impacts on water quality and no impacts on fish biomass (rEIAR, Chapter 7, Otter Assessment). Consequently no negative impacts on otters are anticipated in any of the 3 river catchments.

The Requirement for Mitigation Measures

8.35 Mitigation measures are not required as no significant effects are predicted, either alone or in-combination with other plans and projects.

Residual Impacts

8.36 No residual effects are anticipated on otter. No significant effects are predicted for this species and monitoring has indicated that the watercourses used by this species have recovered.

9 Conclusion

9.1 ESB (Dublin) is preparing a remedial Environmental Impact Assessment Report (rEIAR) for the Derrybrien Wind Farm in response to a European Court of Justice (ECJ) Judgment in 2008 and ECJ Opinion in 2019. The rEIAR has been complemented by an assessment of the Derrybrien Wind Farm with reference to its potential impact on bats and otter, having regard to Article 12 of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').

9.1 A desk study, bat survey and bat monitoring have been used to compile baseline data that have been used as the basis for the assessment. Species recorded within the Wind Farm site are common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle, Nathusius' pipistrelle *Pipistrellus nathusii*, Leisler's bat *Nyctalus leisleri*, brown long-eared bat, whiskered bat *Myotis mystacinus* and Natterer's bat *Myotis nattereri*. There is no evidence that lesser horseshoe bat *Rhinolophus hipposideros* is present: this species is a qualifying feature of the Lough Cutra SAC and the Kiltartan Cave (Coole) SAC, both of which are within the ZoI of the development (see Section 3). None of the other species recorded within the Wind Farm site are SAC qualifying features and therefore they are not subject to the additional legal protection afforded to these sites.

9.2 Common pipistrelle, soprano pipistrelle and Leisler's bat are the species that have been recorded most frequently, with activity varying between months and between turbine locations. These species are considered to have the highest vulnerability of being impacted by the Wind Farm. Carcass searches found a single dead soprano pipistrelle, indicating that the operating wind turbines do occasionally result in the death of bats. Whilst the death of a single bat may not constitute deliberate killing (Article 12(1)a) or deliberate disturbance (Article 12(1)b), this may not be the case if the continued operation of the Wind Farm, without the adoption of any mitigation measures, results in further bat deaths or injury. Determining whether the death, injury or disturbance of a bat is deliberate will depend on the magnitude of the impact that the operating Wind Farm is having on bats. Further monitoring is required in order to confirm that the mitigation proposed will ensure that there is no deliberate disturbance of bats.

9.3 The results of otter surveys have been used to compile baseline data that have been used as the basis for the assessment. This has concluded that otter is likely to have been and remains an infrequent visitor to the site taking into account the habitats that are present and the likely low abundance of prey. The construction and operation phases of the Wind Farm are not likely to have had a significant effect on otter; it is also considered unlikely that the decommissioning phase will have a significant effect on otter.

9.4 The assessment has considered the effects of the Wind Farm with reference to the provisions of Article 12 of the Habitats Directive, in particular Article 12(1)(b), which refers to deliberate disturbance (bats and otter), and Article 12(4), which refers to the incidental killing of Annex IV species (bats). As evidence has been found that indicates that the Wind Farm may result in the incidental killing of bats, monitoring is required as set out within Article 12(4). To date only one dead bat has been recovered but, as noted above, this may be due to a reduced scope of the carcass search that has been completed. Nevertheless, it is known that bat species are present that are considered to be vulnerable to impacts from operating wind turbines and it is known that at least one death has occurred.

9.5 At this point it is not clear what the magnitude of the impact is on bats arising from the operation of the Wind Farm. Whilst there is no evidence to suggest that there has been a species level impact on the bat population as a result of the operation of the Wind Farm, this may be due to a lack of monitoring.

9.6 To determine whether mitigation to reduce fatality levels is appropriate, fatality monitoring during the spring, summer and autumn of each year will be completed for a minimum of three years commencing in August 2020. This will involve:

- Collection of bat activity, fatality and site-specific weather data in each of the three seasons. A proportion (32 of the 70 turbines) will be subject to monitoring using specially trained search dogs.
- Collection of site-specific data on seasonal scavenger removal rates and on the efficiency of detection of animal carcasses by the dogs used for bat searching.
- Modelling / calculation of the level of bat fatality likely to occur over the active season based on the results of the work.
- The production of an annual report detailing the approach to, results and conclusions of the work. Statistical analysis of the relationship between weather and fatality levels will be included. The report will be issued to NPWS and the Determining Authority.
- Discussion of the results of the monitoring with the determining authority (also involving NPWS), to determine an appropriate way forward. This will include a review of the adequacy of the monitoring effort (in light of the results) and discussion of whether turbine curtailment parameters should be varied based on any fatalities, activity and weather conditions recorded. Any variations to the mitigation will be monitored to confirm the mitigation is effective

9.7 It is considered unlikely that the Wind Farm will result in the deliberate disturbance of otter (Article 12(1)) or the incidental killing of otter (Article 12(4)) and so no mitigation measures are proposed.

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Appendix 1: Bat monitoring data from 2016 and 2019

Table A1: Total number of bat passes (P) and activity (P/h) for each bat species recorded during automated surveys in 2016.

	April		May		June		July		August	
Species	**P**	**P/h**	**P**	**P/h**	**P**	**P/h**	**P**	**P/h**	**P**	**P/h**
Common / Nathusius' pipistrelle	21	<0.1	28	0.1	33	0.1	0	0	0	0
Common pipistrelle	320	0.4	74	0.1	2110	4.5	214	0.4	33	0.1
Common / Soprano pipistrelle	1	<0.1	3	<0.1	45	0.1	0	0	0	0
Soprano pipistrelle	25	<0.1	5	<0.1	277	0.6	26	<0.1	27	<0.1
Myotis species	21	<0.1	9	<0.1	28	0.1	25	<0.1	14	<0.1
Myotis / Long-eared bat sp.	0	0	0	0	3	<0.1	0	0	0	0
Long eared bat sp.	4	<0.1	3	<0.1	12	<0.1	0	0	1	<0.1
Leisler's bat	5652	7.0	3388	6.2	418	0.9	151	0.3	138	0.2
Total	6044	7.5	3510	6.4	2926	6.2	416	0.7	213	0.4

The data presented in Tables A2 and A3 show the activity of each species at the different turbine locations sampled in 2016 and 2019 respectively.

Table A2: Activity (P/h) of bat species at each detector location 2016.

Turbine location	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis species	Myotis / Brown long-eared bat	Brown long-eared bat	Leisler's bat	Total
T5	0	0.5	0	0.1	0	0	0	1.4	**2**
T11	0	0.6	0	0	0.1	0	0	1.9	**2.6**
T13	0	0.3	0	0	0	0	0	0.6	**1**
T15	0	0.2	0	0	0	0	0	0.6	**0.9**
T17	0	0	0	0	0.1	0	0	3.7	**3.8**
T18	0	0.7	0	0	0.1	0	0	4	**4.8**
T21	0	0	0	0	0	0	0	4.2	**4.2**
T27	0.1	0.8	0	0.1	0	0	0	6.4	**7.4**
T32	0	2	0	0.1	0	0	0	0.3	**2.6**
T33	0	1.9	0	0.2	0	0	0	8.5	**10.6**
T41	0	2.7	0.2	0.6	0	0	0	0.3	**3.8**
T54	0	0	0	0	0	0	0	2.1	**2.2**
T59	0	0	0	0	0	0	0	0.4	**0.4**
T62	0	0	0	0	0	0	0	0.2	**0.2**
T65	0	1.4	0	0.5	0	0	0	2.8	**4.7**
T67	0	0.1	0	0	0	0	0	0.4	**0.5**
T70	0.1	1.3	0	0.1	0	0	0	6.8	**8.4**
T71	0.1	1.9	0	0.1	0	0	0	7.8	**10**

Table A3: Activity (P/h) of bat species at each detector location 2019.

Turbine location	Nathusius' pipistrelle	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis sp.	Myotis / Long-eared bat sp.	Long eared bat sp.	Leisler's bat	Unidentified bat species	Total bat P/h
T11	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	**0.4**
T13	0.0	0.1	4.7	0.4	0.7	0.0	0.0	0.0	0.7	0.0	**6.8**
T15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
T17	0.0	0.2	3.5	0.6	0.7	0.1	0.1	0.1	1.9	0.0	**7.2**
T18	0.0	0.2	4.6	1.1	0.9	0.1	0.0	0.0	0.3	0.3	**7.6**
T2	0.0	0.2	21.9	2.3	6.9	0.2	0.0	0.2	2.4	0.1	**34.1**
T21	0.0	0.1	3.1	0.1	0.4	0.0	0.0	0.0	0.1	0.0	**3.9**
T27	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.2	0.0	**0.9**
T28	0.1	0.0	1.7	2.3	0.9	0.1	0.1	0.1	1.4	0.0	**6.6**
T3	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.0	0.1	0.0	**1.0**
T32	0.0	0.0	5.1	1.7	1.4	2.8	0.2	0.0	0.0	0.1	**11.4**
T33	0.0	0.0	1.1	0.1	0.6	0.3	0.1	0.1	0.1	0.0	**2.4**
T37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	**0.2**
T38	0.0	0.2	7.2	1.4	2.3	0.2	0.1	0.1	2.5	0.1	**14.1**
T39	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
T41	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**
T44	0.0	0.1	3.3	0.6	0.7	0.0	0.3	0.0	0.6	0.0	**5.8**
T47	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	**0.5**
T49	0.0	0.1	3.8	0.8	3.6	0.1	0.1	0.1	2.0	0.0	**10.7**
T5	0.0	0.0	1.6	0.1	0.5	0.2	0.0	0.0	0.1	0.0	**2.6**
T51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**
T54	0.0	0.0	0.6	0.0	0.1	0.1	0.0	0.0	0.1	0.0	**0.9**
T56	0.0	0.0	1.1	0.2	0.5	0.2	0.0	0.1	1.2	0.0	**3.3**
T58	0.0	0.0	1.6	0.0	0.7	0.1	0.0	0.0	0.7	0.0	**3.3**

Turbine location	Nathusius' pipistrelle	Common / Nathusius' pipistrelle	Common pipistrelle	Common / Soprano pipistrelle	Soprano pipistrelle	Myotis sp.	Myotis / Long-eared bat sp.	Long eared bat sp.	Leisler's bat	Unidentified bat species	Total bat P/h
T59	0.0	0.0	1.0	0.2	0.3	0.1	0.0	0.1	0.7	0.0	**2.4**
T62	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	**0.3**
T65	0.0	0.0	0.9	0.1	0.6	0.1	0.0	0.1	0.2	0.2	**2.2**
T67	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	**0.4**
T69	0.0	0.2	6.4	0.8	4.2	0.1	0.1	0.1	2.6	1.2	**15.8**
T70	0.0	0.0	0.6	0.1	0.3	0.1	0.0	0.0	0.1	0.0	**1.2**
T71	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.2	0.3	**1.2**
T8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	**0.3**
Total bat P/h	**0.0**	**0.1**	**2.4**	**0.4**	**0.8**	**0.2**	**0.0**	**0.0**	**0.6**	**0.1**	**4.6**