7 ORNITHOLOGY

7.1 INTRODUCTION

This Chapter has been prepared by Fehily Timoney and Company (FT) to examine the potential effects that the proposed project (described in **Chapter 2**) may have on the avifauna of the study area. This assessment considers the potential effects with regard to each phase of the development: construction phase, operational phase, and decommissioning phase. Appropriate mitigation measures are described to avoid, or/reduce potential negative effect(s). The mitigation measures detailed within this chapter should be read in conjunction with mitigation measures contained in **Chapter 6: Biodiversity** and those contained in the CEMP (**Volume IV, Appendix 2.1**).

A detailed description of the project assessed in this EIAR is provided in **Chapter 2** and is comprised of the following main elements:

- The wind farm site (referred to in this EIAR as 'the Site');
- The grid connection route (referred to in this EIAR as the 'GCR');
- The turbine delivery route (referred to in this EIAR as the 'TDR' or 'Haul Route');

This Chapter of the EIAR is supported by supporting Figures in **Volume III** and the following Appendix documents provided in **Volume IV**:

- **Appendix 7.1:** Bird Survey Reports
- **Appendix 7.2:** Collision Risk Model Report
- **Appendix 7.3:** Survey Details, Dates and Weather Conditions
- **Appendix 7.4:** Survey Results
- **Appendix 7.5:** Red Grouse Licence

Common acronyms used throughout this EIAR can be found in **Appendix 1.4**.

The main wind farm site includes the wind turbines, internal access tracks, hard standings, the permanent meteorological mast, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure and all associated works related to the construction of the wind farm.

The grid connection includes the buried grid connection cable route which is envisaged to run approximately 19.5km from the on-site substation at Tullaghmore to the 38 kV ESB substation

at Screebe in Co. Galway, following the corridor of regional roads, the N59 National Road and within the proposed wind farm site itself.

The turbine delivery route includes all aspects of the route from the port of Galway to the site entrance including proposed temporary accommodation works to facilitate the delivery of wind turbine components.

Bird surveys of the study area following SNH (2017) guidance were carried out during the winters of 2019-2020, 2020-2021 and 2021-2022, as well as the summers of 2020 and 2021. Three fixed VP locations overlooking the study area were initially used during the VP surveys, with an additional fourth VP added in May 2020. A total of 180.75 and 180.25 hours of survey effort were completed for VPs 1 & 2, respectively, between October 2019 and March 2022 (inclusive). This more than fulfils the minimum survey effort requirement of 180 hours per VP (36 hours per season). VP3 was dropped in April 2021, due to a reduction in the site area. Despite this, SNH requirements were met for the time for which the VP was active, with 114 hours conducted out of a required 114. A total of 144.75 hours was completed for VP4, which fulfils the 144 hours (for 2 years of surveys) required under SNH (2017).

Bird surveys and contributions towards this chapter were completed by Ben O' Dwyer (FT Ecologist, BSc Wildlife Biology), Brian Porter (Subcontractor – Contact Nature; HDip Field Ecology), Chandra Walters (FT Ecologist, BSc Ecology, MSc Horticulture) John Curtin (Eire Ecology), Jon Kearney (FT Principal Ecologist; BSc. Applied Ecology MSc. Ecological Management and Biological Conservation), Niamh Graham (MSc Conservation Behaviour BSc Zoology), Phoebe O'Brien (B.Sc. Environmental Science), and Seán Ronayne (FT Ecologist; BSc. Zoology; MSc. Marine Biology; MSc. Ecological Assessment).

Background information and biographies of surveyors listed above are detailed in **Table 7-1Error! Reference source not found.**:

Table 7-1: Surveyor Biographies

Surveyor	Biography
Ben O'Dwyer	Ben O'Dwyer is an ecologist with Fehily Timoney and Company with over 5 years' experience. He holds a fist class honours Bachelor of Science (BSc) in Wildlife Biology from Institute of Technology Tralee. A large portion of Ben's work is focused on the survey and assessment of proposed renewable energy development sites, and he has carried out comprehensive ecological work for a number of sites, from plant and animal surveys and habitat mapping to Ecological Appraisals, AA Screening Reports, Natura Impact Statements, and Ecological Enhancement plans.
Brian Porter	Brian has over 30 years' experience as an ornithologist and works for Fehily Timoney as a subcontractor. Brian has undertaken surveys for hen harrier as part of 'Contact Nature' and also for NPWS. Brian has experience in winter dawn and dusk vantage point surveys; modified Brown and Sheppard surveys; breeding wader surveys; merlin and barn owl surveys; phase I habitat surveys; mammal surveys; swan and goose flight-line surveys and small aircraft flyover swan surveys. Brian has

Surveyor	Biography
	conducted Countryside Bird Surveys for Birdwatch Ireland since 1998; he is a former contributor to I-WeBS; a surveyor as part of Birdwatch Ireland's Winter Garden Bird Survey since 1996; he is a contributor to the Dublin Field Club annual butterfly survey; a contributor to Bird Atlas 2007-2011; 'Seatrack' sea bird monitoring volunteer; an extensive contributor to each National Hen Harrier Survey (1998/2000; 2005; 2010; 2015) and he is a Hen Harrier Winter Roost Survey volunteer.
Chandra Walters	Chandra holds a BSc in Ecology and an MSc in Organic Horticulture, both degrees were awarded with Honours by University College Cork. Chandra is a dedicated ecologist, with excellent report writing and data management skill. She is skilled with QGIS and SPSS statistics. Chandra has good plant and insect identification skills, particularly for pollinators and freshwater macro-invertebrates. She is also experienced in both terrestrial and freshwater ecology.
John Curtin	John is an experienced subcontracted ecologist and CEO of Eire Ecology with a high skillset over several disciplines. Primarily a field worker with experience in ornithological surveys and monitoring, botanical and habitat identification, and mammal surveys. In addition, he has prepared numerous stage 1 and 2 Natura Impact Statements and Environmental Impact Statements. John has been conducting and overseeing ornithological surveys since 2012 with a focus on wind farm, road, and industrial developments.
Jon Kearney	Jon is a principal ecologist with Fehily Timoney & Company. Jon has over 17 years' experience in both the UK and Ireland. His skills include an extensive knowledge of planning environmental law and planning requirements for ecology and biodiversity. Jon's experience spans ecology survey techniques and methodology, ornithological surveys, mitigation design, water quality assessment, Appropriate Assessment and Ecological Impact Assessment. Jon has completed ecological assessments, EcIAs, Environmental Impact Assessment Reports (EIAR) and Appropriate Assessments for a wide variety of projects in Ireland and the UK.
Niamh Graham	Niamh Graham is an ecologist employed working for Eire Ecology who holds an MSc in Conservation Behaviour (Galway Mayo Institute of Technology) and BSc (Zoology), from NUI Galway. Bird surveying and data collection forms the majority of Niamh's work, and she has worked on numerous renewable energy projects throughout the country.
Phoebe O'Brien	Phoebe O Brien is a subcontracted ecological consultant who worked on this project on behalf of Eire Ecology and has been practicing since 2011 having qualified with a B.Sc. in Environmental Science from NUIG in 2010. Although primarily focusing on botany, Phoebe has experience at a range of ecological disciplines including ornithology.
Sean Ronayne	Seán is a survey ecologist with Fehily Timoney & Company with extensive bird surveying experience. Seán holds a degree (BSc Zoology), and two masters from UCC (MSc Marine Biology + Ecological Assessment). Seán has worked in various ornithological roles both in Ireland and abroad and has been birdwatching for more than 20 years. Two of Seán's dissertations were of an ornithological nature, and he has also published several papers in peer-reviewed journals, most recently on: "An observation of vocal mimicry by Dupont's Lark *Chersophilus duponti* in Catalonia.", published in Revista Catalana d'Ornitologia. Seán is also a very keen sound-recordist and recorded over 200 species of birds in Catalunya, in 2020. Seán is also working to sound record and catalogue all the resident and regularly occurring bird species of Ireland, of which he has recorded 174 species, to date.

7.2 METHODOLOGY

7.2.1 Relevant Guidance

The methodology for this appraisal has been devised in consideration of the following relevant guidance published by the Environmental Protection Agency (EPA) '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' (EPA, 2022) and '*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*' (DoHPLG, 2018) and the Chartered Institute of Ecology and Environmental Management (CIEEM) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Version 1.1)*' (CIEEM, 2018 and revisions).

Additional guidance available from the EU such as '*Guidance document on wind energy developments and EU nature legislation*' (2020) and '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*' (2013) has also been considered. The Heritage Council publication '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al*., 2011) is also referenced.

Relevant guidance from Scottish Natural Heritage (SNH) in relation to birds such as SNH *Recommended bird survey methods to inform impact assessment of onshore windfarms (2017)*. *'Survey Methods for use in assessing the impacts of onshore wind farms on bird communities (2005 & 2010)*' and '*Assessing the cumulative impact of onshore wind energy developments (2012)*' have also been utilised.

Documentation available from Galway County Council (GCC) such as the '*Galway County Development Plan: 2015-2021* and *Galway County Development Plan 2022-2028* has been reviewed and utilised where relevant.

7.2.2 Legislative Context

All birds are protected under the Wildlife (Amendment) Act, 2000.

The conservation of birds and their habitats in Ireland has been expanded by EU law, most notably by the EU Birds Directive and EU Habitats Directive, which provide bird protection legislation.

Species listed in Annex I and migratory species are subject to special conservation measures to protect their habitat, through the establishment of Special Protection Areas (SPAs), under Directive 2009/147/EC on the Conservation of Wild Birds (the Wild Birds Directive). The Habitats Directive (Directive 92/43/EC on the Conservation of Natural Habitats and of Wild Fauna and Flora) and Birds Directive were transposed into Irish law inter alia by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended and the Planning and Development Act 2000 as amended.

7.2.3 Consultation

For a full list of consultations and responses, please see **Appendix 1.3: Scoping Opinion** in **Volume IV**.

7.2.4 Desktop Study

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed, in addition to records of rare/sensitive species within the 10km grid squares overlapped by a 2km buffer surrounding the study area obtained by request from NPWS (received 7th October 2022).

Other data sources include Ireland's Wetlands and their Waterbirds: Status and Distribution (Crowe 2005), the Atlas of Wintering Birds in Britain and Ireland (Lack, 1986), the Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976) and the Breeding and Winter Birds of Britain and Ireland Bird Atlas 2007-11 (Balmer *et al*., 2013).

Other sources included:

- OSI Aerial photography and 1:50000 mapping;
- NPWS website (mapviewer) as well as rare and protected data obtained by request on 20th August 2020;
- National Biodiversity Data Centre (NBDC) website and data obtained on 10th September 2020;
- Teagasc Soil area maps;
- Geological Survey Ireland (GSI) area maps, and;
- EPA website datasets (soil, surface water quality, ground water quality, designated sites).

7.2.5 Field Study

The details, dates and weather conditions are provided in **Appendix 7.3**.

Target Species

The following criteria has been utilised to select target species for the current study. Scottish Natural Heritage (SNH) guidance (SNH, 2017) on the assessment of the effects of wind farms on ornithological interests suggests that there are four important species lists from which target species can be drawn, as follows:

- Species listed on Annex 1 of the Birds Directive (EC, 2009)
- Red-listed birds of Conservation Concern
- Schedule 1 of the Wildlife and Countryside Act 1981 (not applicable in Ireland) and;
- Regularly occurring migratory species.

In addition to the above, consideration was given to species identified locally as being of conservation concern, regionally or those particularly susceptible to impact from wind farm development. Note that not all species on the above lists would be categorised as target species, e.g. most passerine species and general lowland farmland birds are not considered to be particularly susceptible to impacts from wind farms (SNH, 2017).

In the Irish context, it has been suggested that target species should be taken from species of conservation concern in Ireland (BOCCI) (Gilbert *et al*., 2021), those likely to occur within the vicinity of the proposed wind farm, and those most at risk from particular impacts such as disturbance and displacement (Nairn, R. and Partridge, K., 2013).

'Birds of Conservation Concern in Ireland' (BoCCI) are classified into three separate lists: red, amber, and green. Red-listed species are of high conservation concern, Amber-listed species are of medium conservation concern and Green-listed species are considered to be of no conservation concern (Gilbert et al., 2021).

To date four BoCCI lists have been published with the current list by Gilbert *et al*., (2021) superseding the three former lists by Colhoun and Cummins (2013), Lynas *et al*., (2007), and Newton *et al*., (1999).

The conservation status of bird species found in this study was assessed using the most recent (2021) BoCCI List (Gilbert et al., 2021).

Additionally, a review of the bird species listed on Annex I of the EU Birds Directive (2009/147/EC) was undertaken in assessing the conservation status of birds. Annex I species are afforded additional protection through the designation of Special Protection Areas (SPAs) throughout EU countries in addition to existing National legislation.

Overview of methods of surveys

Initial walkovers of the site were carried out to enable the identification of suitable survey locations.

Field surveys were undertaken to gather detailed information on bird distribution and flight activity in order to predict the potential effects of a wind farm development on birds.

The field surveys comprised two main elements; vantage point (VP) watches and targeted distribution and abundance surveys which comprised:

- VP watches undertaken over 2.5 years at four VPs (winter 19/20, winter 20/21, winter 21/22, summer 2020 and summer 2021). Note, that originally three VPs were established to survey the Site, with a fourth added in May 2020. VPs again dropped to three in April 2021, due to a significant reduction (reduction of > 75%) in the site area.
- Transect surveys (winter 19/20, winter 20/21, winter 21/22, summer 2020 and summer 2021);
- Hinterland surveys (winter 19/20, winter 2020/21, winter 21/22, summer 2020 and summer 2021).
- Merlin surveys (summer 2020, and summer 2021).
- Red grouse survey (winter 2020/21).
- Breeding wader transects (summer 2020, and summer 2021).

7.2.5.1 Vantage Point (VP) Watches / Flight Activity Surveys

Selection of VP Locations

Vantage point (VP) surveys were carried out with regard to 'Recommended bird survey methods to inform impact assessment of onshore wind farms' (SNH, 2017).

VP surveys were carried out by suitably qualified personnel over:

- Three winter seasons:
  - a six-month period spanning October 2019 to March 2020 (inclusive), and
  - a six-month period spanning October 2020 to March 2021(inclusive), and
  - a six-month period spanning October 2021 to March 2022(inclusive).
- Two summer seasons:
  - a six-month period spanning April to September 2020 (inclusive), and
  - a six-month period spanning April to September 2021 (inclusive).

The overall aim of these surveys was to quantify the level of flight activity and distribution over the flight activity survey area and to determine bird usage of the site. The flight activity survey area was taken to be that area encompassing the potential development area and 500m beyond the development boundary as potential collision risk, habitat loss and displacement could affect birds outside the proposal site (**Volume III**). Thus, the flight activity area was considerably larger than that required by SNH (2017) guidance, which states that the flight activity survey area should correspond to 500m circular buffers drawn around the location of each proposed turbine.

Vantage points are ideally located on elevated areas, or other areas, which provide clear views over the survey area. Achieving maximum visibility over as much of the site as possible is important for these surveys.

According to SNH (2017) vantage points should be located so as to allow full coverage of the flight activity survey area such that no point is greater than 2km from a VP. To minimise observer effect on bird behaviour, VPs should ideally be located outside the survey area but should be located as close as possible. SNH (2017) stipulates that where VPs are located within the survey area, they should not be used simultaneously with other VPs which overlook them to minimise potential observer effect on birds. This was adhered to during the total survey period.

With regards to the proposed wind farm site, VP locations were selected to provide maximum site coverage. Factors which limited selection of VP locations included the forested nature of the site and the undulating typography of the landscape.

The locating of the VPs within the survey area achieved visual coverage of the site in line with SNH (2017) guidance. Each VP overlaps with at least one other VP. Overlap in VP surveys conducted over the course of the survey period was minimised to reduce the risk of surveyor presence affecting bird behaviour. Surveyor presence did not affect bird behaviour during any of the VP surveys which were carried out; including the single instance of observer overlap at VP2 and VP3 on the 7th May 2020. This was reflected in the flight paths recorded for the various target and secondary species with birds regularly recorded flying in relatively close proximity to surveyors. If observer presence influenced bird behaviour, we would expect to see alterations in flight path to avoid the surveyor. This was not the case and no obvious alterations in flight paths were observed.

Initially, three VP locations were selected to cover the site (VP1 – VP3). In May 2020 an additional VP (VP4) was added to the east of the site to increase the observable area of the flight activity survey area, in response to the addition of Coillte lands by the client to the east of the original site. VP3 was also moved slightly to the west of the site to account for the larger site at the time. VP3 was dropped in April 2021 to reflect a reduction in the site area, following a subsequent removal from the project of the aforementioned Coillte lands. The area of landholding for the proposed wind farm site is 95.3 ha while the area of the landholding for the larger site including Coillte lands was 528.52 ha. As a result of the reduction in site area, additional hours were not required to make up for the later addition of a fourth VP (with the total number of VPs once again being reduced to three). Thus, survey effort across all VP

locations exceeded the recommended amount stated in SNH (2017) guidance. The Irish Transverse Mercator (ITM) grid co-ordinate locations of each VP are provided in **Table** 7-2, below. Figures showing the location of each VP and the viewsheds from each VP in order to show the extent of site coverage are provided in **Volume III**. Full details on individual VP surveys including survey dates, times and weather conditions can be found in **Appendix 7.3**.

Table 7-2: Vantage Point Locations

VP No.	ITM Grid Co-ordinates
1	50374, 74723
2	50121, 74632
3	50345, 74936
3a	50362, 74775
4	50294, 74576

Viewshed Analysis of VP Locations

Viewshed analysis was undertaken for each VP location to determine visual coverage of the survey area (taken to encompass the site and the flight activity survey area). Viewsheds were set to observer height of 2m showing a view of everything over 25m height. Viewsheds encompassed a 2km radius with 360^0 view. Each viewshed was then cropped to an 180^0 arc showing the relevant direction of view.

Viewshed analysis determined that, based on the VP locations selected, visual coverage of approximately 95.45% of the survey area was achieved, thereby ensuring near complete coverage of the flight activity survey area by VP surveys in line with SNH (2017) guidance. Figures showing the viewsheds from each VP in order to show the extent of site coverage are provided in **Volume III**.

Flight Data Recording

During VP surveys the flight behaviour of target species was recorded. Based on the precautionary principle flight behaviour of secondary species was also recorded; however, recording of secondary species was subsidiary to recording of target species (SNH, 2017). At the time of each species observation the following information was recorded:

- The time that the bird was detected;
- The flight duration (seconds) within various flight height categories:
  - October 2019 to March 2020: 0-30m (s), 30-50m (s), 50-150m (s), > 150m (s);

- April 2020 to April 2022: 0-10m (s), 10-20m (s), 20-30m (s), 30-50m (s), 50-100m (s), 100-185m (s), > 185m (s);

- Sex and age of the bird(s) (adult/juvenile), where possible to determine;
- Type of activity/behaviour such as hunting, flying, displaying etc;
- Estimation of actual flight height;
- Habitat(s) where the bird was observed;
- Weather conditions at time of sighting including wind speed and direction.

Once an initial sighting was made, each target or secondary species was observed until lost from view. Flight paths were recorded as observed, including where birds travelled or were observed outside of the flight activity survey area; such that all flight activity within the broader landscape was encompassed.

Details on flight behaviour for each individual target/secondary species observed, including a unique map identifier code which corresponds to a mapped flight path, are provided in tabulated format in **Appendix 7.4**. All flight paths are provided in **Volume III**. Summaries and monthly peak counts of all non-target species of conservation concern recorded during VP surveys are provided in **Appendix 7.4**.

7.2.5.2 Distribution and Abundance Surveys

Distribution and abundance surveys were carried out to record numbers and distributions of breeding, wintering and migrant birds using the site that might be affected either directly or indirectly by the proposed development (e.g., collision risk, habitat loss, displacement effects).

Transect Surveys

A transect survey is a survey along a defined route within the survey area. The overall aim of the transect surveys was to assess general bird distribution throughout the site and gather data on bird usage of the site.

For general breeding bird surveys, the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS) [1]. The study area for this survey comprised a total of two no. c. 1km transects which were selected and centred on different habitats present within the subject site. Birds were counted over two visits, each timed to coincide with the early part of the breeding season (April to mid-May) and later part of the season (mid-May to late June), with visits at least four weeks apart (transect order and

[1] British Trust for Ornithology. http://www.bto.org/volunteer-surveys/bbs/research-conservation/methodology. www.bto.org. [Online]

direction were reversed between surveys to avoid confounding transect order and direction with time of day).

Surveyors recorded all birds seen or heard as they walked methodically along the transect routes. Birds were recorded in four distance categories, measured at right angles to the transect line (within 25m, between 25m - 100m and over 100m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required (BTO, 2018). For the general wintering bird survey, the method utilised was the same as for the breeding bird transects, except it was undertaken in the winter season.

Transect surveys were completed on a monthly basis for three winter seasons; between October 2019 and March 2020, October 2020 to March 2021, and October 2021 to March 2022, as well as two summer seasons; June and September 2020, and between April and August 2020. All bird species seen or heard, typically within 100m of the transect route, were recorded, although the typography of the landscape often allowed for detection of birds at greater distances.

The transect route was selected to provide representative coverage of all habitats, both open and closed, occurring within the site e.g., clear-fell forestry, young/mature forestry, scrub etc.

A map showing the transect survey routes within the proposed wind farm site is included in the Figures in **Volume III**. Details on each transect survey carried out including survey date, time and weather conditions can be found in **Appendix 7.3**. Tabulated results of peak counts for all species recorded during monthly transect and point count surveys are provided in **Appendix 7.4**.

7.2.5.3 Other Winter Surveys

Hinterland Survey

Hinterland surveys were conducted in the area surrounding the potential development area throughout the winter season. These surveys aimed at identifying areas of the surrounding hinterland which were being used, or had the potential to be used, by waders, swans, geese, and other over-wintering species. The hinterland survey area encompassed areas of suitable habitat outside of the site. During year one surveys, a total of 73 sites were visited, owing to the high number of water bodies, surrounding the site. In year two, this number was reduced to 26, with many unproductive sites dropped in year two. A map showing the areas encompassed by the hinterland surveys is included in the Figures in **Volume III**.

Red Grouse Tape Lure Survey

A tape-lure survey for red grouse was conducted on the 17th March 2021 within suitable habitat identified as having potential for this species to occur (see Figures in **Volume III** for red grouse transect survey areas). This survey was carried out under licence from the NPWS (Section 35 Licence No. 05/2021).

7.2.5.4 Other Breeding Season Surveys

Breeding Wader Walkover Surveys

Breeding wader walkover surveys were undertaken in the Summers of 2020 (May, June, and July) and 2021 (April, May, and June) to detect the presence of breeding waders within 2km of the study area. Any sightings of target species exhibiting potential breeding behaviour were investigated to determine breeding status within the study area.

A map showing the areas encompassed by the walkover survey is included in the Figures in **Volume III**.

Breeding Merlin Walkover Surveys

Breeding walkover surveys were undertaken in the Summers of 2020 (May, June, July, August, and September) and 2021 (May, June, July, and August) to detect the presence of breeding merlin within 2km of the study area. Any sightings of merlin exhibiting potential breeding behaviour as well as other signs (plucking posts, pellets, etc) were investigated to determine breeding status within the study area.

A map showing the areas encompassed by the walkover survey is included in the Figures in **Volume III**.

7.2.6 Avifauna Receptor Evaluation

Avifauna resources are to be initially evaluated as to whether or not they constitute key receptors for the assessment following NRA guidance. For the purposes of impact assessment, a receptor 'importance value' or sensitivity, following published guidance as in Percival (2007), SNH (2017) and literature review of published information on birds and wind farms (Pearce-Higgins J. L., 2009; Pearce-Higgins J. S., 2012; Drewitt A. L., 2006; Drewitt and Langston, 2008 and Masden, 2009) is to be calculated. Where provided receptor values from Percival (2007) are below those recommended in guidance within the Irish context (NRA, 2009a); then the evaluation has been increased in line with the recommended Irish evaluation as a precautionary principle. **Table 7-3** illustrates the combined receptor evaluation criteria used to assign sensitivity levels to key receptors:

Table 7-3: Avian Resource Evaluation Criteria

Sensitivity of key receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
Very High.	Species is cited interest of SPA. Species present in Internationally important numbers.	International Importance.	Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive	Species is cited Special Conservation Interest of SPA. Species present in Internationally important numbers. Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive
High	Other non-cited species which contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs in UK) and less common birds of prey. Species listed on Annex 1 of the EU Birds Directive. Regularly occurring relevant migratory species which are rare or vulnerable	National Importance	Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list	Other non-cited / not a Special Conservation Interest species which contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs nationally) and less common birds of prey. Species listed on Annex 1 of the EU Birds Directive. Regularly occurring relevant migratory species which are rare or vulnerable. Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list (in this case BOCCI Red list).
Medium	Species present in regionally important numbers (>1% of regional population). Species occurring within SPA's but not crucial to the integrity of the site. Species listed as priority species in the UK BAP subject to special conservation measures	County Importance	Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive. County important populations of species. Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.	Species present in regionally important numbers (>1% of regional population). Species occurring within SPA's but not crucial to the integrity of the site. Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive. County important populations of species. Species that are rare or are undergoing a decline in quality or extent at a national level.

Sensitivity of key receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
Low	Species covered above which are present very infrequently or in very low numbers. Any other species of conservation interest not covered above, e.g. species listed on the red or amber lists of the BoCC.	Local Importance (High Value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared. Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list.	Locally important populations of priority species identified in the Local BAP, if this has been prepared. Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Amber listed species.
Negligible	Species that remain common and widespread	Local Importance (Low Value)	n/a	Species that remain common and widespread. Green Listed Species.

7.2.7 Assessing Effect Significance

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect of the project on the identified key ecological receptors.

Table 7-4 to **Table 7-9** outline the EPA (2022) evaluation criteria utilised in this appraisal of the Environmental Factor, Ornithology. These criteria are included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports:

Table 7-4: Probability of Effects (EPA, 2022)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 7-5: Quality of Effects (EPA, 2022)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.

Quality of Effect	Description
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 7-6: Significance of Effects (EPA, 2022)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant	An effect which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

Table 7-7: Duration of Effects (EPA, 2022)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 7-8: Types of Effects (EPA, 2022)

Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project.
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.

Type of Effect	Description
'Worst Case' Effects	The effects arising from a project in the case where mitigation measures substantially fail.
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost.
Reversible Effects	Effects that can be undone, for example through remediation or restoration.
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Table 7-9: Definition of Terms – Source, Pathway, Receptor (EPA, 2022)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

7.2.8 Assessing Effect Type and Magnitude

Assessment of effects considers construction, operational and decommissioning effects with reference to the potential for direct, indirect, and cumulative effects. The assessment also takes account of any residual effects that may persist following the implementation of any mitigation or best practice design. The characterisation of effects reflects the ecological structure and function upon which the key ecological receptors depend. Detailed assessment of effects considers the magnitude of effects affecting populations.

This EIAR uses the EPA classification of effects in order to describe the quality, significance, duration, and type of effect. Effects on avifauna are to be assessed following published guidance by Percival (2003). Once key avian receptors have been selected and assigned an evaluation of importance or sensitivity, the significance of potential effects are rated as a product of both the magnitude of the predicted effect and the sensitivity if the key receptor affected. The magnitude of effect is based on probability of the likely effect occurring.

The criteria outlined in **Table 7-10**Table 7-10 below has been developed by Percival (2003) to determine the magnitude of potential effects on a species. Methodology for assessing sites outside of European Sites (i.e. SPAs) state '*the test of significance of an impact will be whether the wind farm impact is causing a significant change to the population its range or distribution*'

(Percival, 2003). It is important to consider availability of alternative habitat elsewhere during this assessment (Percival, 2003).

Table 7-10: Determination of Magnitude Effects (Percival, 2003)

Magnitude	Description
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

The significance of potential effects is assessed by cross tabulating the magnitude of effects and bird sensitivity to predict significance of each potential effect. Population status, distribution, and trends of potentially affected species such as migratory winter birds should be taken into consideration when undertaking the assessment. Significant ratings are interpreted as follows, **very low** and **low** should not normally be of concern however normal design care should be undertaken to minimise effects, **medium** represents a potentially significant effect that requires careful individual assessment, while **very high** and **high** represents a highly significant effect on bird populations. A significance matrix table, combining magnitude and sensitivity to assess overall significance is presented below in

Table 7-11.

Table 7-11: Significance matrix: combining magnitude and sensitivity to assess significance (Percival, 2003)

Significance		Sensitivity			
		Very High	High	Medium	Low
Magnitude	Very High	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Medium	Very High	High	Low	Very Low
	Low	Medium	Low	Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low

7.3 DESCRIPTION OF THE EXISTING ENVIRONMENT

The ecology of the existing environment is described within this section.

7.3.1 Site Description

The proposed wind farm site is located within an upland bogland landscape used for grazing sheep and lies between Maam Cross and Oughterard, Co. Galway. The site is located approximately 30km northwest of Galway City, and 9km west of Oughterard, Co. Galway, within the townlands of Tullaghmore, Tawnaghbeg, and Tullaghaboy.

The Site is located within the townlands of Tullaghmore, Tawnaghbeg, and Tullaghaboy.

The proposed grid connection is located in the townlands of Bunnakill, Derreennagusfoor, Lurgan, Ardderrynagleragh, Knockaphreaghaun, Derroogh North., Knockadav, Gleann Trasna, Illeny, Knockaphreaghaun, Derravonniff, and Glencoh.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are not included as part of the planning application but are assessed a part of this EIAR and are located in the townlands of Derravonniff, Tullymore, and Knockaphreaghaun.

The Site is comprised entirely of peat bogs (code 412). The surrounding study area also comprises of improved agricultural grassland (GA1), coniferous plantation (WD4), hedgerows (WL1), lakes (FL), treelines (WL2) & montane heath (HH4). CORINE 2018 landcover encompassing and surrounding the site includes transitional woodland scrub (code 324), coniferous forests (code 312), water bodies (code 512), sparsely vegetated areas (code 333) and land principally occupied by agriculture with significant areas of natural vegetation (code 243).

There is one river, the Owenwee River, which runs along the boundary of the site and next to the exiting access track into the site from the N59. Other watercourses on site consist of manmade drainage channels and headwaters of the Owenwee and Owenree Rivers, some of which are ephemeral. The proposed Site and its surrounds are located upstream of Lough Corrib Upper which is located approximately 850m from the Site boundary at the closest extent near the proposed T3 turbine position. The Site has indirect hydraulic connectivity to Lough Corrib Upper via the headwaters of the Owenwee and Owenree Rivers which drain the site.

Lough Corrib is the second largest lake in Ireland in terms of area (176km^2) and is designated as the Lough Corrib SAC and SPA. The western portion of the Site is primarily hydraulically characterised by a number of unnamed rivers and streams that are headwaters of the Owenree River which ultimately discharges into Lough Corrib Upper.

The Owenwee River has an overall catchment area of 23.3km^2 and rises near the north-western portion of the Site to the east of the Derroura Forest. The Owenwee River flows in a south-westward direction before turning north-westward at Shannakinloughra and discharging into Tawnaghbeg Lough which in turn is also drained by the Owenree River. Tawnaghbeg Lough is located approximately 200m to the north-east of the larger Loughaunierin, Tawnaghbeg Lough is located approximately 400m west of the EIAR boundary.

The GSI maps and website for this area show that the majority of the Site is underlain by Ordovician age igneous and metamorphic rocks. It should be noted that some outcrops of bedrock are present throughout the Site, particularly within the upland (northern) parts of the Site.

The majority of the main Site is underlain by the Oughterard Granite formation which consists of two main bodies, the Oughterard mass in the east and the Tullaghmore mass in the west, which are linked by a narrow granite strip. The granite is non-porphyritic and medium to coarse grained, with pink or white K-feldspar but also includes areas of granodiorite, tonalite and dacite. The northern part of the main Site (between T3 and T2) is mainly underlain by the Bennabeola Quartzite Formation which comprises Proterozoic age pale quartzite (Argyl Group). A small part of the northeast corner of the Site is underlain by Proterozoic age Streamstown Schist Formation which comprises psammitic pelitic and semi-pelitic schists (Argyl Group).

7.3.2 Desktop Study

7.3.2.1 Sites of International Importance

Special Areas of Conservation (SACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC). There are sixteen SACs within 25km of the proposed Tullaghmore Wind Farm Study Area. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) are designated under the EU Birds Directive (2009/147/EC) ('The Birds Directive'). There are four SPAs within 25km of the study area. See **Table 7-12** for more information.

An Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) have been completed in order to appraise the likely significant effects of the proposed development either alone or in combination with other plans or projects on European Sites (SACs and SPAs); and accompanies this planning application. **Table 7-12** below details the European sites protected for bird species (SPA's) within 25km of the proposed wind farm.

7.3.2.2 Sites of National Importance

Sites of National Importance in Ireland are termed Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA).

While the Wildlife (Amendment) Act 2000 has been passed into law, pNHAs will not have legal protection until the consultative process with landowners has been completed; this process is currently ongoing. For the purposes of this assessment however pNHA's have be treated as fully designated sites. There is one NHA and six pNHA's present within 10km of the proposed wind farm.

Error! Reference source not found. and Error! Reference source not found. show the location of the designated sites in relation to the proposed turbine locations.

The closest designated sites to the project is the Connemara Bog Complex pNHA (site code 002034) and Mamturk Mountains pNHA (site code 002034). See **Table 7-13** Table 7-12: Summary of Special Protection Areas (SPA's) within 25km of the projectfor more information.

Table 7-12: Summary of Special Protection Areas (SPA's) within 25km of the project

Designated Site	Site code	Qualifying Interest	Distance to site (km)
Lough Corrib SPA	004042	• Gadwall (*Anas strepera*) [A051] • Shoveler (*Anas clypeata*) [A056] • Pochard (*Aythya ferina*) [A059] • Tufted Duck (*Aythya fuligula*) [A061] • Common Scoter (*Melanitta nigra*) [A065] • Hen Harrier (*Circus cyaneus*) [A082] • Coot (*Fulica atra*) [A125] • Golden Plover (*Pluvialis apricaria*) [A140] • Black-headed Gull (*Chroicocephalus ridibundus*) [A179] • Common Gull (*Larus canus*) [A182] • Common Tern (*Sterna hirundo*) [A193] • Arctic Tern (*Sterna paradisaea*) [A194] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] • Wetland and Waterbirds [A999]	1 (N)
Connemara Bog Complex SPA	004181	• Cormorant (*Phalacrocorax carbo*) [A017] • Merlin (*Falco columbarius*) [A098] • Golden Plover (*Pluvialis apricaria*) [A140] • Common Gull (*Larus canus*) [A182]	Adjacent to the TDR
Lough Mask SPA	004062	• Tufted Duck (*Aythya fuligula*) [A061] • Black-headed Gull (*Chroicocephalus ridibundus*) [A179] • Common Gull (*Larus canus*) [A182] • Lesser Black-backed Gull (*Larus fuscus*) [A183] • Common Tern (*Sterna hirundo*) [A193] • Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] • Wetland and Waterbirds [A999]	9.5 (N)
Lough Carra SPA	004051	• Common Gull (*Larus canus*) [A182]	24 (NE)

Table 7-13: Summary of National Sites within 10km of the project

Designated Site	Site code	Features of Interest (Birds)	Distance to site (km)
Connemara Bog Complex pNHA	002034	See preceding table	Within
Mamturk Mountains pNHA	002034	Bird species recorded from the site include dipper, heron, kestrel, meadow pipit, peregrine, raven, snipe, stonechat, wheatear and woodcock.	Within
Lough Corrib pNHA	000297	See preceding table	0.8 (NE)

Designated Site	Site code	Features of Interest (Birds)	Distance to site (km)
Maumtrasna Mountain Complex pNHA	000735	This site is of interest as it is a good example of an extensive mountain landscape, containing tracts of upland grassland on both peaty and mineral soils. The summits of the mountains within the site, particularly where there are high altitude cliffs and/or base-rich substrates, provide a locus for a good variety of artic/alpine species, including Alpine Hair-grass (*Deschampsia cespitosa subsp. alpina*), Alpine Meadow Rue (*Thalictrum alpinum*) and Mountain Sorrel (*Oxyria digyna*). The presence of the Rare and legally protected St. John's Wort (*Hypericum canadense*) and other scarce species adds to the interest of the site.	3.7 (NNW)
Oughterard District Bog NHA	002431	Red Grouse	7.5 (SE)
Oughterard National School pNHA	002082	No birds of note. Hosts a Leisler's bat nursery roost which is considered to be the largest in Ireland, possibly in Europe.	9 (SE)
Lough Carra/Mask Complex pNHA	001774	See preceding table	9.5 (NNW)

7.3.2.3 Other Designated Sites

Nature Reserves

There is just one nature reserve within 10km of the proposed development – Leam West.

Ramsar Sites

There are no Ramsar sites within 10km of the proposed development. The closest Ramsar site is Lough Corrib.

7.3.2.4 Avifauna

A desktop study was undertaken to locate any records of rare or protected avian species that have previously been recorded in the site and the surrounding area. Examination of NPWS and NBDC records indicates that there is a combined total of 58 species of ecological importance recorded in the 10km grid square (M04) which overlaps the study area and are listed in **Table 7-14**, below. These species are comprised of 16 that are on the current Birds of Conservation Concern in Ireland (BoCCI) red list (Gilbert *et al*., 2021) and 33 are on the BoCCI amber list (Gilbert et al., 2021). Twelve of the species are further listed on Annex I of the EU Birds Directive (EC, 2009). Seven are species which are not rare (Red or Amber listed) or protected under Annex I (Habitats Directive) but have been included as they are indicator/keystone species and/or may be sensitive to wind farm development; namely common buzzard (*Buteo buteo*), Eurasian sparrowhawk (*Accipiter nisus*), great black-backed gull (*Larus marinus*), grey heron (*Ardea cinerea)*, little grebe (*Tachybaptus ruficollis*), long-eared owl (*Asio otus*), and moorhen (*Gallinula chloropus*).

Of the 58 records, just three were within the last ten years: Amber-listed swallow (*Hirundo rustica*) – 09/04/2015, Amber-listed tufted duck (*Aythya fuligula*) 27/04/2016, and Annex-I protected white-tailed eagle (*Haliaeetus albicilla)* -09/02/2017. No invasive avian species were recorded within the overlapping grid square (M04).

Table 7-14: Rare and protected species of avifauna recorded historically within the 10km square (M04) in which the subject site is located[2]

Species	*Latin*	Year of last record	BoCCI status	Annex I status
Black-headed Gull	*Chroicocephalus ridibundus*	31/07/1991	Amber	No
Buzzard	*Buteo buteo*	31/12/2011	Green	No
Common Gull	*Larus canus*	31/12/2011	Amber	No
Common Sandpiper	*Actitis hypoleucos*	31/12/2011	Amber	No
Common Scoter	*Melanitta nigra*	31/12/2011	Red	No
Common Tern	***Sterna hirundo***	**31/07/1972**	**Amber**	**Yes**
Coot	*Fulica atra*	31/12/2011	Amber	No
Cormorant	*Phalacrocorax carbo*	31/12/2011	Amber	No
Corncrake	***Crex crex***	**31/07/1972**	**Red**	**Yes**
Curlew	*Numenius arquata*	31/07/1972	Red	No
Gadwall	*Anas strepera*	29/02/1984	Amber	No
Goldcrest	*Regulus regulus*	31/12/2011	Amber	No
Golden Plover	***Pluvialis apricaria***	**31/12/2011**	**Red**	**Yes**
Goldeneye	*Bucephala clangula*	31/12/2011	Red	No
Great Black-backed Gull	*Larus marinus*	31/12/2011	Green	No
Great Crested Grebe	*Podiceps cristatus*	31/12/2011	Amber	No
Great Northern Diver	***Gavia immer***	**31/12/2011**	**Amber**	**Yes**
Greenfinch	*Carduelis chloris*	31/12/2011	Amber	No
Grey Heron	*Ardea cinerea*	31/12/2011	Green	No
Grey Wagtail	*Motacilla cinerea*	31/12/2011	Red	No
Hen Harrier	***Circus cyaneus***	**31/12/2011**	**Amber**	**Yes**
Herring Gull	*Larus argentatus*	31/12/2011	Amber	No
House Martin	*Delichon urbicum*	31/12/2011	Amber	No
House Sparrow	*Passer domesticus*	31/12/2011	Amber	No
Kestrel	*Falco tinnunculus*	31/12/2011	Red	No
Kingfisher	***Alcedo atthis***	**31/12/2011**	**Amber**	**Yes**
Lapwing	*Vanellus vanellus*	31/12/2011	Red	No
Lesser Black-backed Gull	*Larus fuscus*	31/07/1991	Amber	No
Linnet	*Carduelis cannabina*	31/12/2011	Amber	No
Little Grebe	*Tachybaptus ruficollis*	31/12/2011	Green	No
Long-eared Owl	*Asio otus*	31/12/2011	Green	No
Mallard	*Anas platyrhynchos*	31/12/2011	Amber	No

[2] Colours correspond to BoCCI conservation status, and Annex I species are shown in bold.

Species	*Latin*	Year of last record	BoCCI status	Annex I status
Meadow Pipit	*Anthus pratensis*	31/12/2011	Red	No
Merlin	***Falco columbarius***	**31/12/2011**	**Amber**	**Yes**
Moorhen	*Gallinula chloropus*	31/12/2011	Green	No
Mute Swan	*Cygnus olor*	31/12/2011	Amber	No
Peregrine	***Falco peregrinus***	**31/12/2011**	**Green**	**Yes**
Pochard	*Aythya ferina*	29/02/1984	Red	No
Red Grouse	*Lagopus lagopus scotica*	31/12/2011	Red	No
Red-breasted Merganser	*Mergus serrator*	31/12/2011	Amber	No
Redwing	*Turdus iliacus*	31/12/2011	Red	No
Sand Martin	*Riparia riparia*	31/12/2011	Amber	No
Short-eared Owl	***Asio flammeus***	**31/12/2011**	**Amber**	**Yes**
Skylark	*Alauda arvensis*	31/12/2011	Amber	No
Snipe	*Gallinago gallinago*	31/12/2011	Red	No
Sparrowhawk	*Accipiter nisus*	31/12/2011	Green	No
Spotted Flycatcher	*Muscicapa striata*	31/12/2011	Amber	No
Starling	*Sturnus vulgaris*	31/12/2011	Amber	No
Swallow	*Hirundo rustica*	09/04/2015	Amber	No
Teal	*Anas crecca*	31/12/2011	Amber	No
Tufted Duck	*Aythya fuligula*	27/04/2016	Amber	No
Wheatear	*Oenanthe oenanthe*	31/12/2011	Amber	No
White-fronted Goose	***Anser albifrons***	**29/02/1984**	**Amber**	**Yes**
White-tailed Eagle	***Haliaeetus albicilla***	**09/02/2017**	**Red**	**Yes**
Whooper Swan	***Cygnus cygnus***	**31/12/2011**	**Amber**	**Yes**
Willow Warbler	*Phylloscopus trochilus*	31/12/2011	Amber	No
Woodcock	*Scolopax rusticola*	31/12/2011	Red	No
Yellowhammer	*Emberiza citrinella*	31/07/1991	Red	No

7.3.3 Field Surveys

7.3.3.1 Target Species Observations (Flight Activity Surveys)

As per the SNH (2017) the site for the purposes for the flight activity surveys (vantage point surveys) is defined not by the planning boundary for the Site but by a 500m radius circle (buffer) around the proposed wind turbines locations. The proposed turbine locations form the centre point of each of these 500m radius buffers. This study area is called the '**flight activity survey area**' and is unique to this survey type. Any target species passing within this 500m buffer from proposed turbine locations (flight activity survey area) is considered within the main wind farm site under the SNH (2017) guidance.

Target species recorded are shown below in **Table 7-15**.

During the winter 2019/2020 season, nine target species were recorded. Of these, four species were red-listed (golden plover, kestrel, red grouse, and woodcock), four species were amber-listed (common gull, cormorant, mute swan, and white-fronted goose), and one was green-listed (buzzard). Golden plover and white-fronted goose are also listed under Annex I of the EU Birds Directive.

During the winter 2020/2021 season, twelve target species were recorded. Of these, four species were red-listed (kestrel, red grouse, snipe, and woodcock), five species were amber-listed (common sandpiper, cormorant, greylag goose, mallard, and merlin), and three were green-listed (buzzard, greenshank, and grey heron).

During the winter 2021/2022 season, thirteen target species were recorded. Of these, three species were red-listed (golden plover, snipe, and woodcock), seven species were amber-listed (common gull, cormorant, greylag goose, herring gull, mallard, merlin, and whooper swan) and three were green-listed (great black-backed gull, grey heron, and moorhen). Golden plover, merlin, and whooper swan are also listed under Annex I of the EU Birds Directive.

During the summer 2020 season, fifteen target species were recorded. Of these, four species were red-listed (golden plover, kestrel, red grouse, and woodcock), ten species were amber-listed (brent goose, common gull, cormorant, hen harrier, herring gull, lesser black-backed gull, mallard, merlin, mute swan, and red-breasted merganser), and four were green-listed (buzzard, great black-backed gull, grey heron, and sparrowhawk). Hen harrier and merlin are also listed under Annex I of the EU Birds Directive.

During the summer 2021 season, twelve target species were recorded. Of these, three species were red-listed (kestrel, snipe, and white-tailed eagle), six species were amber-listed (common gull, cormorant, greylag goose, mallard, merlin, and red-breasted merganser), and four were green-listed (buzzard, great black-backed gull, grey heron, and sparrowhawk). Merlin and white-tailed eagle are also listed under Annex I of the EU Birds Directive.

Table 7-15: Target species and species of conservation concern recorded on Tullaghmore vantage point surveys between October 2019 and March 2022, inclusive.

Species	BoCCI	Annex I	Winter 19/20	Winter 20/21	Winter 21/22	Summer 2020	Summer 2021
Brent goose	Amber	No				✓	
Buzzard	Green	No	✓			✓	

Species	BoCCI	Annex I	Winter 19/20	Winter 20/21	Winter 21/22	Summer 2020	Summer 2021
Common gull	Amber	No	✓		✓	✓	✓
Common sandpiper	Amber	No		✓			
Cormorant	Amber	No	✓	✓	✓	✓	✓
Golden Plover	**Red**	**Yes**	✓		✓		
Great black-backed gull	Green	No		✓	✓	✓	✓
Greenshank	Green	No		✓			
Grey heron	Green	No		✓	✓	✓	✓
Greylag goose	Amber	No		✓	✓		✓
Hen harrier	**Amber**	**Yes**				✓	
Herring gull	Amber	No			✓	✓	
Kestrel	Red	No	✓	✓		✓	✓
Lesser black-backed gull	Amber	No				✓	
Mallard	Amber	No		✓	✓	✓	✓
Merlin	**Amber**	**Yes**		✓	✓	✓	✓
Moorhen	Green	No			✓		✓
Mute swan	Amber	No	✓			✓	
Red grouse	Red	No	✓	✓			
Red-breasted merganser	Amber	No				✓	✓
Snipe	Red	No		✓	✓		✓
Sparrowhawk	Green	No				✓	
White-fronted goose (Greenland)	**Amber**	**Yes**	✓				
White-tailed eagle	**Red**	**Yes**					✓
Whooper swan	**Amber**	**Yes**			✓		
Woodcock	Red	No	✓	✓	✓		

7.3.3.2 Hinterland Surveys

Hinterland surveys to establish occupancy and quantity of target species that could potentially cross the site whilst moving to and from roosting and feeding grounds within a 10km radius of the site were carried out monthly across two and a half years of surveys, between October 2019 and March 2022, inclusive. These surveys were for wintering (IWeBS-style survey) and breeding target species.

Target species recorded are shown below in **Table 7-16**.

During the winter 2019/2020 season, 20 target species were recorded. Of these, one species was red-listed (goldeneye), fifteen were amber-listed (black-headed gull, common gull, cormorant, goosander, great crested grebe, great northern diver, greylag goose, lesser black-backed gull, mallard, mute swan, red-breasted merganser, teal, tufted duck, whooper swan,

and wigeon) with the remainder green-listed (great black-backed gull, grey heron, little grebe, and moorhen). Great northern diver and whooper swan are also listed under Annex I of the EU Birds Directive.

During the winter 2020/2021 season, 17 target species were recorded. Of these, four species were red-listed (golden plover, red grouse, snipe, and woodcock), eleven were amber-listed (common gull, cormorant, great crested grebe, greylag goose, herring gull, lesser black-backed gull, mallard, merlin, mute swan, red-breasted merganser, and whooper swan) with the remainder green-listed (little grebe and moorhen). Golden plover, merlin, and whooper swan are also listed under Annex I of the EU Birds Directive.

During the winter 2021/2022 season, 19 target species were recorded. Of these, two species were red-listed (golden plover, and snipe), 13 species were amber-listed (black-headed gull, common gull, cormorant, great crested grebe, greylag goose, herring gull, lesser black-backed gull, mallard, mute swan, red-breasted merganser, teal, tufted duck, and whooper swan), with the remainder green-listed (great black-backed gull, grey heron, and little grebe)

During the summer 2020 season, ten target species were recorded. Of these, two species were red-listed (kestrel and white-tailed eagle), four species were amber-listed (common gull, cormorant, lesser black-backed gull, mute swan, and teal) with the remainder green-listed (great black-backed gull, peregrine, and sparrowhawk). Peregrine and white-tailed eagle are also listed under Annex I of the EU Birds Directive.

During the summer season 2021, 12 target species were recorded. Of these, snipe was red-listed, nine species were amber-listed (black-headed gull, common sandpiper, cormorant, greylag goose, mallard, mute swan, red-breasted merganser, and tufted duck) with the remainder green-listed (great black-backed gull, little grebe, and moorhen). Golden plover, and whooper swan are also listed under Annex I of the EU Birds Directive.

Species of conservation concern that are known to be potentially vulnerable to wind farm developments will be discussed in more detail in this section.

Species have been selected for detailed discussion on the basis of conservation status, vulnerability to wind farm developments and if species sightings have been confirmed on or near the proposed wind farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment.

Table 7-16: Target species and species of conservation concern recorded on Tullaghmore hinterland surveys between October 2019 and March 2022, inclusive.

Common Name	Scientific Name	BoCCI*	Annex I**	Winter 19/20	Winter 20/21	Winter 21/22	Summer 20	Summer 21
Black-headed gull	*Chroicocephalus ridibundus*	Amber	No	✓		✓		✓
Common gull	*Larus canus*	Amber	No	✓	✓	✓	✓	✓
Common sandpiper	*Actitis hypoleucos*	Amber	No					✓
Cormorant	*Phalacrocorax carbo*	Amber	No	✓	✓		✓	✓
Golden plover	***Pluvialis apricaria***	**Red**	**Yes**		✓	✓		
Goldeneye	*Bucephala clangula*	Red	No	✓				
Goosander	*Mergus merganser*	Amber	No	✓				
Great black-backed gull	*Larus marinus*	Green	No	✓	✓		✓	✓
Great crested grebe	*Podiceps cristatus*	Amber	No	✓	✓	✓		
Great northern diver	***Gavia immer***	**Amber**	**Yes**	✓				
Grey heron	*Ardea cinerea*	Green	No	✓	✓			
Grey wagtail	*Motacilla cinerea*	Red	No					
Greylag goose	*Anser anser*	Amber	No	✓	✓	✓		✓
Herring gull	*Larus argentatus*	Amber	No		✓	✓		
Kestrel	*Falco tinnunculus*	Red	No				✓	
Lesser black-backed gull	*Larus fuscus*	Amber	No	✓	✓	✓	✓	
Little grebe	*Tachybaptus ruficollis*	Green	No	✓	✓	✓		✓
Mallard	*Anas platyrhynchos*	Amber	No	✓	✓	✓		✓
Merlin	***Gallinula chloropus***	**Amber**	**Yes**		✓			
Moorhen	*Gallinula chloropus*	Green	No	✓	✓	✓		✓
Mute swan	*Cygnus olor*	Amber	No	✓	✓	✓	✓	✓
Peregrine	***Falco peregrinus***	**Green**	**Yes**				✓	
Red grouse	*Lagopus lagopus scotica*	Red	No		✓			
Red-breasted merganser	*Mergus serrator*	Amber	No	✓	✓	✓		✓
Sand martin	*Riparia riparia*	Amber	No					✓

Common Name	Scientific Name	BoCCI*	Annex I**	Winter 19/20	Winter 20/21	Winter 21/22	Summer 20	Summer 21
Skylark	*Alauda arvensis*	Amber	No					✓
Snipe	*Gallinago gallinago*	Red	No		✓	✓		
Sparrowhawk	*Accipiter nisus*	Green	No				✓	
Teal	*Anas crecca*	Amber	No	✓	✓	✓		
Tufted duck	*Aythya fuligula*	Amber	No	✓		✓		✓
Wheatear	*Oenanthe oenanthe*	Amber	No					✓
White-tailed eagle	***Haliaeetus albicilla***	**Red**	**Yes**				✓	
Whooper swan	***Cygnus cygnus***	**Amber**	**Yes**	✓	✓	✓		
Wigeon	*Anas penelope*	Amber	No	✓				
Woodcock	*Scolopax rusticola*	Red	No		✓			

* Species of conservation concern in Ireland (BOCCI) (Gilbert *et al*., 2021).

** Species listed on Annex 1 of the Birds Directive (EC, 2009).

7.3.3.3 Winter and Breeding Walkover Surveys

Transect surveys for all species were recorded during monthly surveys of the proposed wind farm site over three winters and two summers. This survey captured the baseline of avian species using the site as well as their abundance and includes seasonal visitors of the winter (i.e., golden plover) and summer months (i.e., cuckoo, and swallow). Over the entire survey period, a total of 15 bird species were recorded. Of the 15 species, two are Annex 1 listed (golden plover, and white-tailed eagle), five are red-listed (golden plover, meadow pipit, red grouse, snipe, and white-tailed eagle) and three are amber-listed (linnet, skylark, and swallow). The recorded information is provided in **Table 7-17**:

Table 7-17: Target species and species of conservation concern recorded on Tullaghmore transect surveys (wintering and breeding) between October 2019 and March 2022, inclusive

Species	BoCCI	Annex I	Winter 19/20		Winter 20/21		Winter 21/22		Summer 2020		Summer 2021	
			Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
Blackbird	Green								2	0.5		
Cuckoo	Green								1	0.3		
Golden plover	**Red**	✓			**6**	**1**	**24**	**3.4**				
Hooded crow	Green		4	0.7	5	0.8	11	1.6	5	1.3		
Linnet	Amber						7	1				
Meadow pipit	Red		28	4.7	12	2	18	2.6	36	9	55	13.8
Raven	Green		4	0.7	4	0.7	7	1	2	0.5		
Red grouse	Red						1	1	1	0.3		
Skylark	Amber		12	2	5	0.7			23	5.8	16	4
Snipe	Red		2	0.3	8	1.3	5	0.7			4	1
Song thrush	Green								1	0.25		
Stonechat							1	1				
Swallow	Amber										9	2.3
White-tailed eagle	**Red**	✓			**2**	**0.3**						
Wren	Green								2	0.5		

7.3.3.4 Breeding Wader Surveys

Survey transects to assess the presence of breeding wader populations were completed during the months of May, June, and July 2020, as well as April, May, and June 2021. A number of methods were combined from published literature including Bibby et al, (2000), Gilbert et al, (1998), Brown & Shepherd (1993) and SNH 2017 to estimate numbers of target species breeding within the study area. A total of three transects were used to sample habitat deemed suitable for breeding waders on site. No breeding waders were found on site over the combined 2020/2021 survey periods.

7.3.3.5 Merlin Surveys

Merlin surveys were centred on suitable habitat for the species and methods used are based on previous surveys in Ireland (Lusby et al. 2011 and Fernandez et al. 2010); developed in association with Dr. John Lusby of BirdWatch Ireland. The study area for Merlin is defined as a 1km square centrally placed on suitable habitat.

Three visits were undertaken in 2020, each at 4-week intervals and timed to coincide with periods of Merlin activity (April to mid-May, mid-May to late June, and July to mid-August). Note an extra fourth visit was undertaken in August. A further seven visits were undertaken in 2021. This is more than double the number (three) of visits typically carried out for this species.

No live sightings or signs of merlin were detected during combined 2020/2021 survey periods.

7.3.3.6 Red Grouse Surveys

A red grouse survey was conducted at Tullaghmore on the 17th March 2021. Methodology from the national Red Grouse survey (2006/2007 to 2007/2008, managed by BirdWatch Ireland and financed by the NPWS) was adopted as laid out in the conditions of the licence (licence reference number: 065/2021) (see **Appendix 7.5**). This methodology is laid out in Cummins et al. (2010).

Under the terms of the NPWS licence, surveys are required to be conducted in suitable weather conditions (no rain, no strong winds and with good visibility). Although some very light drizzle was recorded, this was very brief and did not affect visibility, nor was it considered to hamper survey results.

The national survey used national grid one-kilometre by one-kilometre squares; the study at Tullaghmore instead investigated the full area of the Site itself. Two observers walked parallel linear transects (oriented in a north-south direction) across the selected area at a distance of c. 150m apart. The transect method involved walking in a straight line (where possible), using landscape features and/or a GPS unit to walk towards pre-selected points

The surveyor carried a battery-powered megaphone which was attached to mobile with a recording of the call of the male Red Grouse on it. In this way, the megaphone was used to broadcast the grouse calls across the study area. The recorded call often elicits a response from grouse.

The 'tape lure' (actually a sound file of the call of the Red Grouse played via the megaphone) was played at 250 metre intervals along each transect for a period of approximately 30 seconds at each stop. The observers stopped and scanned with binoculars for birds as the tape was being played and immediately after the tape had finished. If no response has been elicited after 30 seconds, the tape was played again for another 30 seconds, and the observer waited and scanned for another 30 seconds before continuing on the route.

During the survey there were two sightings of red grouse. The first sighting was of a single dark bird which was flushed and flew west from bog along transect one. The second sighting involved a single dark bird flushed from bog along transect one, thought to be the same individual flushed previously. Single roost sites were located along both transects. A roost site along transect one was located in a section bog where sheep-grazing was less prevalent. A second single roost with faecal matter was located along transect two on Curraun Hill in bog. A small number of fresh pellets were noted along transect one with a single pellet also noted along transect two. A feather spot (approximately 20) was noted along transect two, with two feathers noted at transect three (see figures in **Volume III**).

Table 7-18: Red grouse survey results

Record number	Transect	Time	Easting (ITM)	Northing (ITM)	Findings
1	T1a	09:59	502628	747474	Dark bird flying away W not calling
2	T1a	10:27	502349	747758	Dark bird likely same as previous sighting, flushed away W, not calling.
3	T1b	10:51	502161	747605	Roost site without caecal. Single roost in section of peatland less grazed than to SE.
4	T1b	10:57	502376	747506	Small number of fresh pellets without caecal
5	T2b	13:11	503614	748219	Feather spot (approx. twenty)
6	T2b	13:25	503585	748077	Roost site with caecal
7	T2b	13:39	503561	748280	Single pellet
8	T3b	14:48	504769	746447	2 feathers

7.3.3.7 Non-target Species Recorded During VP Surveys

Non-target species were also recorded during 2019/2020, 2020/2021, and 2021/2022 vantage point survey periods, as a summary additional species, noted during each survey. In total, 38 non-target species were recorded during the entire two and a half years of surveys.

Of these 38 species, three were red-listed (grey wagtail, meadow pipit, and redwing), and nine were amber-listed (goldcrest, greenfinch, linnet, sand martin, skylark, starling, swallow, wheatear, and willow warbler). See **Table 7-19** for further details:

Table 7-19: Non-target Species Recorded During VP Surveys

Species	BoCCI	Annex I	Winter 19/20	Winter 20/21	Winter 21/22	Summer 2020	Summer 2021
Blackbird	Green	No	✓	✓		✓	
Blue Tit	Green	No				✓	
Bullfinch	Green	No	✓				
Chaffinch	Green	No	✓		✓	✓	
Coal Tit	Green	No	✓		✓	✓	✓
Common Crossbill	Green	No	✓	✓			
Cuckoo	Green	No					✓
Dunnock	Green	No					✓
Fieldfare	Green	No	✓		✓		
Goldcrest	Amber	No				✓	
Goldfinch	Green	No		✓	✓	✓	
Greenfinch	Amber	No					✓
Grey Wagtail	Red	No			✓		
Hooded Crow	Green	No	✓	✓	✓	✓	✓
Jay	Green	No	✓	✓	✓	✓	✓
Lesser Redpoll	Green	No				✓	
Linnet	Amber	No		✓	✓		✓
Long-tailed Tit	Green	No				✓	
Magpie	Green	No	✓		✓	✓	
Meadow Pipit	Red	No	✓	✓	✓	✓	✓
Mistle Thrush	Green	No		✓	✓		✓
Pheasant	Green	No	✓	✓	✓	✓	✓
Pied Wagtail	Green	No	✓			✓	
Raven	Green	No	✓	✓	✓	✓	✓
Redwing	Red	No	✓		✓		
Robin	Green	No	✓		✓	✓	✓
Rook	Green	No		✓			✓
Sand Martin	Amber	No					✓

Species	BoCCI	Annex I	Winter 19/20	Winter 20/21	Winter 21/22	Summer 2020	Summer 2021
Siskin	Green	No	✓	✓			✓
Skylark	Amber	No		✓	✓		✓
Song Thrush	Green	No	✓		✓	✓	✓
Starling	Amber	No			✓	✓	
Stonechat	Green	No		✓	✓	✓	✓
Swallow	Amber	No				✓	✓
Wheatear	Amber	No					✓
Willow Warbler	Amber	No					✓
Woodpigeon	Green	No	✓	✓	✓	✓	✓
Wren	Green	No	✓		✓	✓	✓

7.3.3.8 Target species recorded during VP, transects and other species-specific surveys

The following target species were recorded during Vantage Point surveys, transects and other species specific survey. The records of these species during hinterland surveys have also been included to provide context in relation to connectivity to important habitats in the surrounding area outside of the proposed wind farm site. The study area for VP surveys is called the 'flight activity survey area' and is unique to this survey type. Any target species passing within this 500m buffer from proposed turbine locations (flight activity survey area) is considered within the proposed wind farm site under the SNH (2017) guidance. Many of the observations of target species were outside of the flight activity survey area. However, the details of these observations were noted during the survey. The 'rotor sweep zone' is the height at which the proposed turbine blades would be rotating. It extends for the minimum tip of the blade from the ground to the maximum tip height of the blade in rotation.

With a proposed hub height of 104m and a blade radius of 81m, the lower tip height is 23m and the upper tip height is 185m. Theoretically birds flying within this height range (23m to 185m) would be at risk of collision without the consideration of avoidance.

Table 7-20: Observation time recorded during Vantage Point surveys within the flight activity survey area (500m turbine buffer) and the rotor sweep zone – 2019 to 2022

Species	Total Observation time during VPs (Seconds)	Total observation time in the flight activity survey area (Seconds)	Percentage of all VP observation time in the flight activity survey area (%)	Total observation time in the Rotor Sweep zone (Seconds)	Percentage of all VP observation time in the Rotor Sweep zone (%)
Brent Goose	8	0	0	0	0
Buzzard	1668	708	0.032	688	0.030837

Species	Total Observation time during VPs (Seconds)	Total observation time in the flight activity survey area (Seconds)	Percentage of all VP observation time in the flight activity survey area (%)	Total observation time in the Rotor Sweep zone (Seconds)	Percentage of all VP observation time in the Rotor Sweep zone (%)
Common Gull	987	297	0.013	77	0.003451
Common Sandpiper	60	0	0	0	0
Cormorant	1124	630	0.028	395	0.017704
Golden Plover	41	121	0.005	0	0
Great Black-backed Gull	1602	900	0.040	600	0.026893
Greenshank	60	0	0	0	0
Grey Heron	770	307	0.014	136	0.006096
Greylag Goose	176	30	0.001	30	0.001345
Hen Harrier	351	160	0.007	62	0.002779
Herring Gull	324	90	0.004	90	0.004034
Kestrel	2489	2298	0.103	324	0.014522
Lesser Black-backed Gull	320	159	0.007	89	0.003989
Little Grebe	216630	0	0	0	0
Mallard	110903	270	0.012	160	0.007171
Merlin	457	116	0.005	0	0
Mute Swan	43200	0	0	0	0
Red Grouse	65	60	0.003	0	0
Red-breasted Merganser	67	0	0	0	0
Snipe	177	19	0.001	9	0.000403
Sparrowhawk	212	0	0	0	0
White-fronted Goose (Greenland)	60	0	0	0	0
White-tailed Eagle	120	0	0	0	0
Whooper Swan	300	0	0	0	0
Woodcock	3	3	0	0	0

7.3.3.8.1 Brent Goose

Vantage Point Surveys Summer Season 2020

A single flightline of this green-listed species was made on the 21st May 2020 at VP2 during which a lone individual was seen flying between trees for eight seconds (s), with three seconds spent in the 10-20m height band, and five seconds in the 20-30m height band, before landing on the water in a lough to the west of the proposed wind farm. The flightline occurred completely outside the flight activity survey area (the prescribed SNH buffer of a 500m radius around each of the proposed turbines).

7.3.3.8.2 Buzzard

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A total of four buzzard sightings were made during the 2019/2020 winter season, with no records in the following 2020/2021 winter season. Of these four sightings, one was recorded at VP1 on the 28th October 2019, and involved a single bird noted flying for 48 seconds in the 50-150m height band. The remaining three records all come from VP3 on 3rd March 2020, with two sightings involving a single bird. A second bird (a male) briefly joined a female on one occasion. Two flightlines were inside the flight activity survey area (9 seconds at 0-30m, 32 seconds at 30-50m, and 238 seconds at 50-100s). Of interest was a sighting of a single bird seen diving at an adult red deer on several occasions. As this sighting occurred on the 19th March 2020, this also points towards territoriality.

Vantage Point Surveys Summer Season 2020, 2021

A total of four buzzard sightings were made during the summer 2020 season, all of which occurred in July, with a single record from VP2 on the 9th July 2020 and a further three records two days later from VP1 on the 11th July 2020. The majority (90%) of flight time was spent in the 30-50m height band, with a total of 460 seconds logged. A further 23 seconds were noted in the 50-100m height band, with 15 seconds spent at 0-10m, 7 seconds at 10-20m, and a further 7 seconds at 20-30m. All sightings involved single birds soaring, hovering, and plunging after prey – indicating hunting. All four flightlines intersected with the flight activity survey area with a total of 409 seconds flying at heights within the rotor sweep zone.

7.3.3.8.3 Common Gull

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, and 2021/2022

A single sighting of common gull, involving a single bird, occurred in the combined 2019/2020, and 2020/2021 winter seasons, at VP2 on 21st March 2020. This bird was observed flying in the 0-30m height band for 53 seconds outside the flight activity survey area to the west of the

proposed wind farm. As common gull breeds on lakes in the greater area (outside the wind farm site), this bird was presumably a returning breeder. An additional two records occurred in winter 2021/2022, both of which involved three birds recorded from VP2 on the 29th March 2022, with one bird seen flying for 25 seconds at 30-50m (outside the flight activity survey area), and the second for 77 seconds at 100-185m (inside the flight activity survey area).

Vantage Point Surveys Summer Season 2020, 2021

A total of 18 sightings of common gull were recorded in the 2020 (no. 7) and 2021 (no. 11) summer seasons. Of these 18 sightings, eight were recorded in April, three in May, five in June, with the remaining two in July. The majority of sightings (15) came from VP2, with the remaining records (3), coming from VP3. Most sightings (12) were of single birds, however there were four sightings of two birds, one record of four birds, and another single record of six birds.

The high count of six birds were observed on the 21st April from VP2, and were noted as probable breeding pairs, and were observed landing by the lake shoreline near the VP outside the site. A single bird heard vocalising for the duration of surveys (six hours) from VP2 on the 19th July indicates a bird on territory outside the flight activity survey area. Only three sightings were within the flight activity survey area. All sightings were recorded below the rotor sweep zone, with the majority of time (533 seconds) spent in the 10-20m height band. The remaining 356 seconds were logged in the 0-10m height band. As previously mentioned, a single individual spend the entirety of the VP survey calling from the ground, which amounted to six hours or 21,600 seconds all outside the flight activity survey area.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Amber-listed common gull was recorded on 12 occasions across 12 hinterland sites (Lough Ahalia South, Clogherkinnalougha, Lettercraffroe Lough & Lough Acogga, Lough Corrib E, Lough Corrib Q, Lough Corrib T, Lough Corrib W, Lough Corrib N, Lough Corrib L, Lough Corrib G, Lough Corrib B, and Lettercraffroe Lough & Lough Acogga) during the Year 1 survey period, in the months of February, March, and May 2020, with high counts of 19 birds at Lough Corrib (E) on 6th February 2020, and 11 birds at Lough Corrib (B) on 18th March 2020.

The species was observed on ten occasions with two sightings in winter, and eight in summer, during the year 2 survey period. A total of four sightings came from Lough Anillaun/Small Lakes, which also hosted the record counts of eight birds on 21st April 2021 and six birds on 26th of June 2021. Other high counts include six birds at Lough Adrehid on 11th April 2021, and four birds at Upper Corrib on 8th July 2021. An adult with two fledged young were seen at Lough Anillaun/Small Lakes on 19th July 2021.

Common gull was recorded twice during winter 2021/2022 surveys, with a record of seven birds at Lough Adrehid on the 9th March 2022, and another record of seven birds at Loughnacrevy on the 29th March 2022.

7.3.3.8.4 Common Sandpiper

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single record of amber-listed common sandpiper was noted on the 25th March 2021 from VP4 when a lone bird was disturbed, taking flight, vocalising, and circling for 60 seconds in the 0-10m height band, before landing again nearby. The entire observation occurred to the south of the proposed wind farm outside the flight activity survey area. The were no further observations of the species during the 2.5 years of VP surveys.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Amber-listed common sandpiper was recorded on five occasions, between 21st April 2021 and 8th July 2021, from two sites, namely Lough Anillaun/Small Lakes and Lough Boffin. A bird alarming at Lough Anillaun/Small Lakes Common Sandpiper

7.3.3.8.5 Cormorant

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Single cormorants were recorded on two occasions during winter 2019/2020 & 2020/2021 VP seasons – one from VP3 on the 25th November 2019, with the other logged from VP2 on the 16th March 2021. Both sightings were below the rotor sweep area and outside the flight activity survey area, with a total of ten seconds logged in the 0-10m height band. An additional five sightings occurred in the winter 2021/2022 season, all of which occurred from VP two, with all records involving single birds except for one record of two birds.

A sum of 229 seconds occurred during this period, of which 207 seconds occurred in the rotor sweep zone and the flight activity survey area.

Vantage Point Surveys Summer Season 2020, 2021

Cormorants were observed on 20 occasions during the two years of summer season surveys in 2020 and 2021. The majority of sightings (16) were made from VP2, with a further three sightings from VP3, as well as a single sighting from VP1. The majority of sightings (16) were of single birds, with four sightings of two birds. Three sightings in Summer 2020 occurred within the flight activity survey area and in the rotor sweep zone, of which 25 seconds was spent in the 20-30m height band, with 27 seconds at 30-50m, and a further 20 seconds at 50-

100m. Four sightings occurred in the flight activity survey area in the summer of 2021, however, just two occurred in the rotor sweep zone, with a total of 110 seconds spent in the 20-30m height band.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Amber-listed cormorant was recorded on 51 occasions during the first year of surveys. These records occurred between November 2019 and May 2020 across 28 hinterland sites (Lettercraffroe Lough & Lough Acogga, Lough Agraffard, Lough Anillaun, Lough Aphreahragen, Lough Aughawoolia, Lough Aunierin, Lough Bofin West, Lough Corrib B, Lough Corrib D, Lough Corrib E, Lough Corrib F, Lough Corrib G, Lough Corrib H, Lough Corrib I, Lough Corrib J, Lough Corrib L, Lough Corrib M, Lough, Corrib N, Lough Corrib O, Lough Corrib Q, Lough Corrib T, Lough Corrib U, Lough Corrib W, Lough Derryhallagh, Lough Nahasleam, Lough Nahillion, Loughaphreaghaun & Leam West Bog Reserve, Loughaunfree, and Tawnaghbeg Lough), with a high count of ten birds at Lough Corrib (H) on 23rd January 2020.

During the second year of surveys (summer 2020, winter 2020/2021), cormorant was further recorded on 16 occasions across seven sites, with 12 records occurring in winter, and four in summer, between 16th October 2020 and 11th September 2021. Lough Anillaun/Small Lakes hosted the highest number of records (four), however, the highest count of seven birds came from Lough Corrib, on 30th November 2020, and refers to birds roosting on rocks. The next highest count, involving three birds, also refers to a rock-roost, at Upper Corrib on 11th September 2021.

Cormorant were recorded on eight occasions during winter 2021/2022 surveys, across four sites, between the 1st November 2021 and the 29th March 2022. High counts of four birds occurred at the Upper Corrib on the 1st November 2021, and the 9th March 2022.

7.3.3.8.6 Golden Plover

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Annex I protected golden plover was recorded on two occasions during the winter 2019/2020 and 2020/2021 seasons. On 19th November 2020, an unknown number of birds were heard (not seen) in flight for ten seconds, over VP3 outside the flight activity survey area. Likewise, on 28th February 2021, an unknown number of birds were again heard flying over VP1 for ten seconds outside the flight activity survey area. An additional three records occurred in the winter 2021/2022 season. All three of these records occurred inside the flight activity survey area but below the rotor sweep zone. On the 11th January 2022, two records of fifteen birds,

presumably the same birds, occurred at VP1, initially flushed by a merlin – they flew for a combined 16 seconds at 0-10m. The final record occurred from VP4 on the 22nd February 2022 and involved three birds seen flying for five seconds at 10-20m. There were no records of the species during the summer season surveys in 2020 and 2021.

Winter Walkover Surveys 2019/2020 & 2020/2021 and 2021/2022

Whilst there were no sightings of golden plover during transect surveys in the winter 2019/20 season, two sightings occurred the following winter season (2020/21). A record of four individuals occurred in the 0-25m distance band occurred along Transect 1 on the 30th October 2020. An additional sighting involving two birds occurred, again from Transect 1, on the 16th February 2021. An additional two records occurred during the winter 2021/2022 season. On the 29th December 2021, 20 birds were flushed in the 25-100m distance band from transect 2, before circling and landing further ahead of the observer. On the 23rd January 2022, four birds were detected in the 25-100m distance band, vocalising, circling and eventually landing approximately 50m away from the observer.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Golden plover was recorded on four occasions, all of which occurred in winter at Lough Anilaun. On 5th December 2020 (year 2), approximately 50 birds were flushed from bog near the foreshore at Lough Anilaun. On 16th January 2021 (3rd winter season) two birds were disturbed. On the 5th November 2021, 20 birds were flushed from the bog adjacent to the lake. On the 9th March 2022, 32 birds, some of which had attained summer plumage, were noted foraging on the bog adjacent to the lake.

7.3.3.8.7 Great Black-backed Gull

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Green-listed great black-backed gull was not recorded during the winter 2019/2020 season. The species was however recorded on four occasions in winter 2020/2021. Of these four sightings, one was at VP4 on the 30th January 2021, with the remaining three sightings from VP2 on the 18th February 2021. The majority of time (180s) was spent in the 0-10m height band, with the remainder (100s) in the 10-20m height band. All four records during this period were outside the flight activity survey area.

An additional six records occurred in winter 2021/2022, from VPs 1, 2, and 4, each involving single birds. Five of these records were inside the flight activity survey area with four of these flying at heights within the rotor sweep zone. A total of 860 seconds of flight time was recorded

within the flight activity survey area during this period, of which 560 seconds was in the rotor sweep zone.

Vantage Point Surveys Summer Season 2020, 2021

A total of seven sightings were noted during the summer 2020 season, all of which were recorded on the 7th May 2020, with four records from VP3, and three records from VP2. Only one of the records was within the flight activity survey area a single great black-backed gull flying between 100-185m for 40 seconds.

A further two sightings were recorded during the summer 2021 season, all of which came from VP2, with a single record on the 21st April, and the remaining two sightings from the 20th September. Total flights times were evenly distributed between 0-10m, 20-30m and 50-100m with a total of 60 seconds spent in each height band.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Recorded on 17 occasions across 12 locations between the 17th December 2019 and the 9th March 2022, with all records referring to either singles or two birds.

7.3.3.8.8 Greenshank

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single record of the green-listed species greenshank was noted on 30th October 2020, flying over VP4 for 60 seconds, in the 0-10m height band to the south of the proposed wind farm site (outside the flight activity survey area).

7.3.3.8.9 Grey Heron

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single record was noted in the winter 2020/2021 season on the 22nd November 2020, from VP4 involving a single bird to the south of the proposed wind farm site (outside the flight activity survey area). An additional eight records were noted from VPs 1, 2, & 4 during winter 2021/2022 surveys with seven records of single birds and one record of a group of three. Four of these records were within the flight activity survey area. The total flight time for these records was 413 seconds, of which 68 seconds occurred in the rotor sweep zone (in the 30-50m height band). There were no records of grey heron during the winter 2019/2020 season.

Vantage Point Surveys Summer Season 2020, 2021

Six sightings were recorded in summer 2020 surveys (May, June, and September) at VPs 1, 2, 3, and 4. Flights occurred between zero and 50m, with the greatest amount of time (88

seconds, out of 200), spent in the 30-50m height band. A further record occurred on the 25th May 2021 at VP2, involving a single bird flying for 150 seconds in the 10-20m height band. Only two flightlines during the two summers of surveys occurred within the flight activity survey area (25th of June 2020 and the 25th of May 2021). The combined time for these two flightlines was 218 seconds, of which 68 seconds occurred within the rotor sweep zone (at 30-50m).

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Green-listed grey heron was recorded on eleven occasions across eight sites between November 2019 and March 2022, with high counts of two birds at Lough Corrib (A) on 23rd January 2020 and two at Lough Adrehid on 18th March 2020.

7.3.3.8.10 Greylag Goose

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single sighting was recorded during the winter 2020/2021 season, on the 20th February 2021, involving two birds noted from VP3, flying north-north-west for 30 seconds in the 50-100m height band within the flight activity area. Another single record involving two birds occurred during the winter 2021/2022 season from VP2 on the 12th January 2022, with two birds seen flying for 86 seconds at 30-50m, to the west of the proposed wind farm site outside the flight activity area.

Vantage Point Surveys Summer Season 2020, 2021

On 21st April 2021, two birds were noted from VP2 flying for 60 seconds in the 10-20m height band from the direction of Lough Boffin towards a series of smaller lakes to the southwest of the proposed wind farm outside the flight activity area.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

The amber-listed greylag goose was recorded on nine occasions between the 5th March 2021 and 8th July 2021, across five sites. High counts include a group of 30 adults and three juveniles at Lough Boffin on 24th May 2021, with 24 at the same site on 5th March 2021. A group of 22 birds were noted at Upper Corrib on 8th July 2021. This is a separate population to that of Lough Boffin.

7.3.3.8.11 Hen Harrier

Vantage Point Surveys Summer Season 2020, 2021

Eight sightings of this Annex I protected species were recorded between May and June 2020 at VPs 1 and 4. Note that all records in May occurred at VP1 on the same date – 24th May 2020. Likewise, all June records occurred at VP4 on the same date – 12th June 2020. All four

records of the species on the 24th of May 2020 were within the flight activity survey area, however just 62 seconds of flight time occurred within the rotor sweep zone (at 20-30m). Flights occurred between 0 – 30m, with a total of 31 seconds spent in the 0-10m height band, 198 seconds in the 10-20m height band, and 122 seconds in the 20-30m height band. There were no sightings of the species during the 6 months of breeding season survey in 2022. Similarly, there were no sightings of the species during the 3 winter season surveys.

7.3.3.8.12 Herring Gull

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single sighting of two birds occurred from VP2 on the 29th March 2022 with 32 seconds spent in the 100-185m, (rotor sweep zone) with the flight activity survey area.

Vantage Point Surveys Summer Season 2020, 2021

Seven sightings of this amber-listed species were recorded between May and June 2020 at VPs 1, 2, and 3. Flights were recorded between 0 - 100m, with the majority of time spent in the 30-50m height band (103 seconds out of 212). Only one of these flightlines was recorded within the flight activity survey area - an observation of a single bird from VP1 on the 25th June 2020. This record occurred wholly in the rotor sweep zone, with 48 seconds in the 30-50m height band, and 10 seconds in the 50-100m height band.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

A single herring gull, was noted at Lough Agraffard, perched on a rock at the edge of the lake, on the 11th December 2020.

7.3.3.8.13 Kestrel

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Two sightings of kestrel were logged during the 2019/2020 winter season. A single bird was observed from VP1 on 5th February 2020 hovering for four seconds in the 30-50m height band, and 61 seconds in the 50-150m height band, before swooping down onto prey, further noted as staying down and not seen flying away. A second sighting was made on the 19th March 2020, involving a single bird which was seen for in flight for a total of 19 seconds. The majority of flight time (10 seconds) was spent in the 50-100m height band. This bird was further noted stooping at a raven with or also at a buzzard. Both of these flightlines were within the flight activity survey and the rotor sweep zone.

A further ten sightings were recording during the winter 2020/2021 season, each involving single individuals. Six of these flightlines were within the flight activity survey area, with just

one in the rotor sweep zone, on the 22nd November 2020 at VP4, involving a single bird flying for 240 seconds at 50-100m. The four remaining flightlines were recorded outside the flight activity survey area. The majority of flight time (28 minutes and two seconds) was spent in the 10-20m height band. An additional 240 seconds was spent in the 50-100m height band (as previously mentioned), with a further 67 seconds spent in the 10-20m height band. Four of these records involved hunting birds, three of which came from VP4 on the 22nd November 2020, with the other record occurring at VP3 on the 20th January 2021.

Vantage Point Surveys Summer Season 2020, 2021

A total of three sightings were noted during the summer 2020 season, all of which came from VP2 on the 21st May, each involving a single individual, with flight times of five seconds at 0-10, eight seconds at 10-20m, and seven seconds at 20-30m. Of these three sightings, two involved hunting, with the third noted as circling a field near forestry considered to be exhibiting hunting behaviour. None of the flightlines recorded during the summer 2020 period were within the flight activity survey area.

A further ten sightings were recorded during summer 2021 surveys, all of which involved single birds. Seven of these flightlines were within the flight activity survey area but all of these were below the rotor sweep zone. The remaining three were recorded outside the flight activity survey area. Of these ten sightings, six occurred on the 31st August at VP4, and an additional two sightings from VP2 on the 20th September, with a further two records from VP1 on 21st September. The majority of flight time during these ten sightings occurred in the 0-10m height band, with the remaining 159 seconds spent in the 10-20m height band. Of these ten sightings, seven were of hunting birds.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Red-listed kestrel was recorded on four occasions during hinterland surveys, with a record of a hunting female at Tullaghmore (C) on 27th July 2020 (year 1), with another single record of a male which flew from the ground at Lough Boffin on 17th September 2020 (year 1). The remaining two records refer to a hunting bird at Lough Aunierin on the 1st November 2021 (3rd winter).

7.3.3.8.14 Lesser Black-backed Gull

Vantage Point Surveys Summer Season 2020, 2021

Five sightings of lesser black-backed gull, each involving single birds, were recorded between May and June 2020, at VPs 2, 3, and 4. Flights were recorded between 0 - 50m, with the majority of time spent in the 10-20m height band (121 seconds out of 320), and the 30-50m

height band (110 seconds out of 320). Only one of the flightline intersected the flight activity survey area. On the 24th of June 2020, one lesser black-backed gull was recorded flying within the rotor sweep zone, with 59 seconds at 20-30m and 30 seconds at 30-50m.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Amber-listed lesser black-backed gull was recorded across five sites (Lough Anillaun, Lough Corrib N, Lough Corrib R, and Lough Corrib T) on four occasions during year 1, three of which occurred in March 2020 (year 1), with the remaining record from May 2020. All records involved sightings of two birds.

A further record comes from the 2020/2021 winter season (3rd winter), with a single bird noted on the 16th October 2020, sitting on the water at Lough Derryhallagh.

7.3.3.8.15 Little Grebe

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Two sightings of little grebe were made from VP2 on the 13th November 2020, both of which refer to a single bird seen swimming and feeding on the lake visible from the viewpoint. An additional four sightings occurred from VP2 during the winter 2021/2022 season, between the 5th November 2021 and the 29th March 2022. All records refer to stationary birds and were located outside the flight activity survey area.

Vantage Point Surveys Summer Season 2020, 2021

No flightlines were recorded for this species during the summer 2020 season, however, two records of stationary birds were made from VP2 on 7th May and 17th September, both involving single birds, on the eastern lake, situated between VP2 and the site boundary. Of these two records, one was noted as foraging in the lake.

Little grebe was observed on six occasions during the summer 2021 season. As in 2020, all sightings involved stationary birds feeding and diving, recorded from VP2. Furthermore, all records involved single birds, except for a record of two juveniles on 19th July 2021.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Green-listed little grebe was recorded on 23 occasions, between November 2019 and March 2020 (year 1), across 15 sites (Ardderry Lough West, Clogherkinnalougha, Lough Ahalia South & Lough Knockaunawaddy, Lough Aughawoolia, Lough Corrib D, Lough Corrib E, Lough Corrib L, Lough Corrib M, Lough Corrib N, Lough Corrib P, Lough Corrib R, Lough

Corrib S, Lough Shannagrena, Tawnaghbeg Lough, and Two Small Loughs) with high counts of three birds at Lough Corrib (L, M & P) on 4th February 2020.

A further twelve records were logged during year 2 summer and winter seasons, between the 16th October 2020 and 20th September 2021, across five sites (Little Lake, Lough Adrehid, Lough Anillaun, Lough Anillaun/Small Lakes, Lough Aughawoolia, and Lough Aunierin) with a high count of six birds recorded on the 26th June 2021 at Lough Anillaun. This record involved three adults and three juveniles.

A total of eight records were logged during the winter 2021/2022 (3rd winter) season, across five sites (Lough Annilaun, Lough Adrehid, Lough Corrib, Lough Maumwee, and Lough Shindilla).

7.3.3.8.16 Mallard

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A total of seven sightings occurred during the 2020/2021 winter season. As in the previous summer season, all but one sighting occurred from VP2, with the other sighting again coming from VP3. Of these seven sightings, a total of 150 seconds was spent flying in the 0-10m height band, with a further 22 seconds spent in the 10-20m band all outside the flight activity survey area. These typically involved birds making short commuting flights between waterbodies to the southwest of the proposed wind farm. An additional ten sightings occurred from VP2 between the 5th November 2021 and the 29th March 2022, with one record of a single bird, four records of two birds, four records of four and a maximum count of five birds. All time was spent below the rotor sweep zone with just one sighting occurring with the flight activity survey area (two birds in flight for 10 seconds at 0-10m from VP3 on the 25th March 2021). No sightings of the species were recorded during winter 2019/2020.

Vantage Point Surveys Summer Season 2020, 2021

A total of eight sightings of mallard occurred in the 2020 summer season with seven of these occurring at VP2. The remaining sighting came from VP3. The majority of flight time (120 seconds) was logged in the 50-100m height band, followed by 90 seconds at 10-20m, 75 seconds at 0-10m, 30 seconds at 20-30m, with the remaining 20 seconds spent in the 30-50m height band. The majority of sightings involved multiple birds, with a high count of six birds from VP2 on the 17th September 2020. A further four sightings involved two birds, there were two sightings involving three birds with just one sighting involving a single bird. Of these eight sightings, two occurred within the flight activity survey area, one of which occurred in the rotor

sweep zone (160 seconds spent between 20 and 100m from VP2, involving three birds, on 7th May 2020)

A further six sightings occurred in the summer 2021 season with five sightings from VP2 and a single sighting from VP4. All flight times (109 seconds) were logged in the 0-10m height band and were outside the flight activity survey area. Of the six sightings, four involved single birds, with the remaining two referring to pairs.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Amber-listed mallard was recorded on 50 occasions during the year 1 survey period. Records occurred between November 2019 and March 2020 across 27 sites (Clogherkinnalougha, Loghnacrevy, Lough Adrehid , Lough Ahalia North, Lough Aughawoolia, Lough Bofin East, Lough Bofin West, Lough Corrib B, Lough Corrib A, Lough Corrib E, Lough Corrib F, Lough Corrib G, Lough Corrib H, Lough Corrib I, Lough Corrib K, Lough Corrib L, Lough Corrib M, Lough Corrib N, Lough Corrib O, Lough Corrib Q, Lough Corrib T, Lough Corrib U, Lough Corrib W, Lough Lurgan, Lough Nahasleam, Small Lough - Lurgan Townland, and Tawnaghbeg Lough), with a high count of six birds at Lough Corrib (A) on 18th March 2020.

During the year 2 survey (winter 2020/2021 and summer 2021) period mallard was further recorded on 27 occasions between 16th October 2020 and 20th September 2021, across 12 sites. High counts include 12 birds recorded at Lough Boffin on 26th August 2020, seven birds at Lough Boffin on 11th December 2020, with another seven at Lough Adrehid on 11th September 2021.

An additional 14 records were logged during the winter 2021/2022 (3rd winter) season across six sites, with a high count of eight birds at Lough Boffin on the 9th October 2021.

7.3.3.8.17 Merlin

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Whilst there were no winter sightings during the winter 2019/2020 surveys. Merlin was noted on four occasions between the 20th of January 2021 and 25th March 2021 during the winter 2020/2021 season. Of these records, one was heard only (20th January 2021 at VP3) and one (18th February 2021 at VP2) was unconfirmed to species level, noted as probable merlin. All four records were inside the flight activity survey area but were in the 0-10m flight band and therefore outside the rotor sweep zone.

An additional three records occurred during the winter 2021/2022 season all outside the flight activity survey area. On the 5th November 2021, a single bird was seen briefly in flight, before landing on the bog and again taking flight towards some nearby birch trees, before being lost to view. The sighting lasted for a total of 120 seconds and occurred solely in the 0-10m height band, below the rotor sweep zone.

The second sighting occurred from VP1 on the 29th November, when a single bird was seen on a fence post, before flying into a nearby conifer plantation. This sighting lasted a total of 25 seconds and occurred between 0-10m, also below the rotor sweep zone. Finally, on the 11th January 2022, a single merlin was seen in pursuit of a small flock of golden plover, from VP1, with a total of 11 seconds noted in the 0-30m height band.

Vantage Point Surveys Summer Season 2020, 2021

On the 24th of June 2020, six single-bird sightings were noted at VP2, involving a bird flying fast and low to the ground in pursuit of meadow pipits and other species. Most of the time (134 seconds of 136) was spent flying in the 0-10m height band, with just two seconds spent in the 10-20m height band all below the rotor sweep zone and outside the flight activity survey area.

An additional sighting, from the 31st August 2021 at VP4 refers to an unconfirmed sighting which was noted as being obviously smaller than a kestrel – possibly merlin. This bird was seen flying for ten seconds in the 0-10m height band below the rotor sweep zone and outside the flight activity survey area.

Breeding Merlin Surveys Summer 2020, 2021

No merlin were directly observed during merlin surveys within the proposed site, nor were any signs of the species detected. There was no evidence of breeding merlin within the site or immediately surrounding it. A sighting of a single bird in June 2020 at VP2, suggests that the species might breed in the greater surrounds, although an unpaired sub-adult cannot be ruled out based on this sighting alone.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Annex I protected merlin was recorded on three occasions, all of which occurred in winter, between 7th November 2020 and 7th January 2021 (year 2), across three different sites, namely Lough Aughawoolia, Upper Corrib, and Lough Lurgan/Ardferry. All sightings involved single birds.

7.3.3.8.18 Moorhen

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A total of seven records occurred from VP2 between the 12th January 2022, and the 29th March 2022. All sightings involved stationary birds foraging or commuting at water level. There were no sightings of the species flying within the rotor sweep zone within the flight activity survey area during the winter season.

Vantage Point Surveys Summer Season 2020, 2021

Green-listed moorhen was noted seven occasions, all of which came from VP2, in summer, between 21st April and 20th September 2021. All records involved stationary birds with maximum counts of three on 26th June and 19th July 2021, involving an adult and two chicks. There were no sightings of the species flying within the rotor sweep zone within the flight activity survey area during the summer season.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Green-listed moorhen was observed on two occasions during year 1 surveys, with a record of a single bird at Lough Adrehid on the 17th December 2019, and another record of a single bird at Lough Corrib (P) on the 23rd January 2020.

A further ten records were logged during the year 2 survey seasons, with records occurring between the 17th October 2020 and the 11th September 2021. All sightings occurred at Lough Adrehid, with most referring to single birds. A high count of five birds, involving two adults and three chicks was made on the 8th July 2021.

Recorded once during winter 2021/2022 (3rd winter) surveys with a sighting of a single bird foraging on Lough Adrehid on the 9th March 2022.

7.3.3.8.19 Mute Swan

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single record of amber-listed mute swan was noted from VP2 on 13th November 2020 which involved a single birds swimming and feeding on the nearby lake for the duration of the VP (six hours or 21,600 seconds) outside the flight activity survey area.

Vantage Point Surveys Summer Season 2020, 2021

No flightlines were recorded, however an observation of two birds was made from VP2 on 7th May 2020, involving birds swimming outside the flight activity survey area.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Amber-listed mute swan was recorded on 17 occasions between November 2019 and May 2020 (year 1) across 11 sites (Knockaunawaddy, Lough Ahalia South & Lough Knockaunawaddy, Lough Aughawoolia, Lough Corrib A, Lough Corrib L, Lough Corrib N, Lough Corrib O, Lough Corrib P, Lough Corrib Q, Lough Corrib T, and Lough Corrib U), with high counts of five birds at Lough Corrib (A) on 18th December 2019, an additional five birds at Lough Corrib (Q), and four birds at Lough Corrib (O) on 23rd January 2020. Breeding was confirmed (occupied stick nest) at Knockaunawaddy on 23rd May 2020.

During the year 2 survey period mute swan was further recorded on six occasions between 30th November 2020 and 3rd June 2021, with four winter records and two summer records. Sightings occurred across four sites with a high count of three birds.

The species was recorded a further four times during winter 2021/2022 (3rd winter) surveys, with all records coming from Lough Adrehid between 29th October and 1st November 2021, with each record referring to two birds.

7.3.3.8.20 Red Grouse

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

No flightlines of red grouse were recorded during 2019/2020 winter surveys, however, a single stationary sighting occurred from VP1 on 28th October 2019. An additional sighting occurred at VP3 on 20th January 2021 when a single bird was flushed and seen in flight for five seconds in the 0-10m height band outside the flight activity survey area.

Winter Walkover Surveys 2019/2020 & 2020/2021 and 2021/2022

A single grouse was flushed from transect 3 on the 28th October 2021.

Breeding Walkovers Summer 2020, 2021

A singing male, noted as a possible breeder, was noted on the 12th May 2020 from Transect 1 in the 100m+ distance band.

Red Grouse Survey 2021

During targeted red grouse surveys on the 17th March 2021, there were two sightings of red grouse. The first sighting was of a single dark bird which was flushed and flew west from bog along transect one. The second sighting involved a single dark bird flushed from bog along transect one, thought to be the same individual flushed previously. Single roost sites were located along both transects. A roost site along transect one was located in a section of bog

where sheep-grazing was less prevalent. A single roost with fecal matter was located along transect two on Curraun Hill in bog. A small number of fresh pellets were noted along transect one with a single pellet also noted along transect two. A feather spot (approximately 20) was noted along transect two, with two feathers noted at transect three.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Red-listed red grouse was noted on one occasion at Lough Corrib on 16th October 2020 (year 2), involving a single bird which flushed and flew a short distance.

7.3.3.8.21 Red-breasted Merganser

Vantage Point Surveys Summer Season 2020, 2021

A single sighting of this amber-listed species was recorded at VP2 on 21st May 2020, involving two birds flying for seven seconds in the 0-10m height band. An additional sighting of a stationary pair occurred at VP2 on 7th May 2020. A further sighting from VP2 on 25th May 2021, involved two birds swimming for 60 seconds. All sightings were from birds in a lough to the southeast of the proposed wind farm site. All sightings were outside the flight activity survey area and rotor sweep zone.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Red-breasted merganser was recorded on ten occasions between December 2019 and March 2020 (year 1), across eight sites (Lough Corrib A, Lough Corrib B, Lough Corrib F, Lough Corrib P, Lough Corrib Q, Lough Corrib T, Lough Corrib U, and Lough Corrib W). High counts of four birds occurred at Lough Corrib (A, W, F, & B), on 18th December 2019, 23rd January 2020, 18th March 2020, and 18th March 2020, respectively.

During the year 2 survey period, red-breasted merganser was further observed on four occasions between 16th October 2020 and 11th September 2021, across three sites, with two winter and two summer records. High counts of six birds were recorded at Upper Corrib on 10th May and 11th September 2021.

Finally, one record occurred during the 3rd winter season (winter 2021/2022), when a single bird was observed diving at Lough Agraffard on the 4th December 2021.

7.3.3.8.22 Snipe

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Although there were no winter 2019/2020 sightings, red-listed snipe was noted on six occasions during the second winter season. Observations during the season occurred

between 22nd November 2020 and 25th March 2021. A total of four records occurred at VP4, with the remaining two occurring at VP3. All records involved birds flushed, flying a short distance (no longer than ten seconds). Of these sightings, just one occurred in the flight activity area, however, it did not occur in the rotor sweep zone. All flight time (41 seconds) occurred in the 0-10m height band outside the flight activity survey area. A further 13 records occurred during winter 2021/2022 surveys, between 28th October 2021 and 22nd February 2022, from VP4 and VP1. Of these sightings, two occurred in the flight activity survey area (one bird at VP4 on the 14th January 2022, and one bird at VP4 on the 22nd February 2022), both of which occurred in the rotor sweep zone, with a total of nine seconds spent at 0-30m. A high count of 12 birds occurred on the 23rd November 2021.

Vantage Point Surveys Summer Season 2020, 2021

There were no sightings during the summer 2020 season, however, two sightings occurred during summer 2021. Both of these occurred at VP4, on 27th April 2021 and the 30th May 2021, each involving single birds flushed. Both birds flew in the 0-10m height band, (below the rotor sweep zone) for ten and five seconds, respectively.

Winter Walkover Surveys 2019/2020, 2020/2021, and 2021/2022

Snipe were noted on two occasions during winter 2019/2020 walkover surveys. On the 19th December 2019, a single bird was noted from Transect 1 in the 0-25m distance band. On the 23rd January 2020 a single bird was again noted from Transect 1 in the 0-25m distance band. An additional five records occurred during the winter 2021/2022 season between 28th October 2021 and 31st March 2022. Records came from all three transects, each involving single birds flushed, with three records occurring in the 0-25m distance band and the remaining two occurring at 25-100m.

A further eight sightings occurred between the 30th October 2020 and the 16th February 2021, during winter 2020/2021 walkover surveys, all of which involved single birds. Of these eight sightings, three occurred from Transect 1, with the remaining five coming from Transect 2. All birds were seen in the 0-25m distance band.

Finally, five records occurred during the winter 2021/2022 season, between the 28th October 2021 and the 31st March 2022, all involving single birds flushed

Breeding Walkovers Summer 2020, 2021

Snipe were recorded on three occasions during summer 2021 walkover surveys, all of which came from Transect 2. On the 27th April 2021, a single bird was flushed from the 0-25m

distance band. On the 30th June 2021 a single bird was flushed, again from the 0-25m distance band, with a second heard drumming. This was considered to be a likely breeding pair. A second sighting of a flushed bird from the 0-25m distance band was likely to be one of the aforementioned pair.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Red-listed snipe was recorded on six occasions between 16th October 2020 and 29th March 2022 across five sites, with high counts of two birds from 16th October 2020 at Lough Derryhallagh, 13th November 2020 at Lough Lurgan & Small Lakes, 21st April 2021 at Lough Anillaun/Small Lakes and 29th March 2022 at Loughnacrevy.

Breeding Wader Surveys 2020, 2021

No evidence of breeding snipe were noted during combined 2020/2021 breeding wader surveys. A single snipe was flushed from a section of degraded bog, along transect 1 on the 07/07/20 and again on 30/05/21, however, despite extensive searching on both occasions, no other birds were found, and breeding was deemed unproven.

7.3.3.8.23 Sparrowhawk

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

A single sighting comes from VP2 on the 16th December 2019, involving three birds: a male displaying with a second male and a female seen briefly. A total flight time of 210 seconds was logged, with 17 seconds at 0-30m, 24 seconds at 30-50m and 169 seconds at 50-150m all outside the flight activity survey area to the west of the proposed wind farm site. There were no sightings of sparrowhawk during the winter 2020/2021 or the 2021/22 seasons.

Vantage Point Surveys Summer Season 2020, 2021

A single sighting comes from VP3 on the 29th May 2020, involving a single bird flying very low in the 0-10m height band, along a path for two seconds veering into a copse of trees, disappearing from view. The sighting was located to the south of the proposed wind farm outside the flight activity survey area.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

A single (incidental) record of green-listed sparrowhawk was noted when a male flew across the N59 on 12th May 2020 (year 1).

7.3.3.8.24 White-fronted Goose

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

On the 28th October 2019, a lone white-fronted goose or small family group gave three single calls over an approximate sixty second period, flying low over forestry to the east of the proposed wind farm outside of the flight activity survey area.

7.3.3.8.25 White-tailed Eagle

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Annex-I protected white-tailed eagle was noted once, at VP1 on 28th February 2021, soaring over a hill behind Lough Boffin in the >185m height band for 120 seconds 1km south of the proposed wind farm (outside the flight activity survey area).

Winter Walkover Surveys 2019/2020 & 2020/2021

Two white-tailed eagles, mobbed by two ravens were noted on the 30th October 2020 from Transect 1 in the 100m+ flight band, flying northwest behind Tullaghboy Hill, before flying across the site.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

White-tailed eagle was recorded on two occasions outside the site, on the same date (26/08/20), at two different hinterland sites (Tullaghmore H + G) involving two different birds. The individual at Tullaghmore G was a 3–4-year-old bird noted soaring over Lough Corrib for seven minutes at 10-75m at 12:40, before reappearing at 12:50 and then soaring northwest at 75-125m. The second individual at Tullaghmore H was an adult which flew northwest from Curraun Hill for three minutes at a height of approximately 50m.

7.3.3.8.26 Whooper Swan

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Whooper swan was recorded once from VP2 on the 10th February 2022, when four birds were noted feeding on the lake outside the flight activity survey area, for the duration of the survey period of three hours. There were no records of the species within the flight activity survey area.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Recorded on seven occasions between November 2019 and February 2020 (year 1), across six hinterland sites (Leam West Bog Reserve & Lough Cromlee, Lettercraffroe Lough & Lough Acogga, Lough Corrib P, Lough Derryhallagh, Lough Nahasleam, Lough Nahillion, and Loughaphreaghaun & Leam West Bog Reserve), with high counts of seven birds at Lough Corrib (P) on 23rd January 2020, with eight birds at the same site on 4th February 2020.

During the second year of surveys (summer 2020, winter 2020/2021), whooper swan was further recorded on five occasions between 17th October 2020 and 11th December 2020. Three of these records came from Lough Adrehid where the maximum count of nine birds also occurred, on 7th November 2020. The next highest count, involving five birds, was recorded at Lough Agraffard on 11th December 2020.

Recorded twice during the winter 2021/2022 season, with five birds seen at Lough Adrehid on the 9th January 2022, including three immature birds. A single bird was seen at Lough Agraffard on the 6th April 2022.

7.3.3.8.27 Woodcock

Vantage Point Surveys Winter Season 2019/2020, 2020/2021, & 2021/2022

Two records of woodcock during January 2020 while the surveyor was en-route to vantage points. A single bird was flushed from the track at 07:58 on way to VP1 on 21st January 2020. The other bird was flushed en-route to VP3 on the 22nd January 2020. An additional bird was flushed en route to VP1 on the 21st November 2021 and was seen in flight from 0-10m for three seconds.

Hinterland Surveys Year 1, Year 2, and Winter 2021/2022

Red-listed woodcock was recorded once, on the 13th November 2020 (year 2) at Lough Lurgan & Small Lakes, where a single bird was flushed by the observer whilst walking through the area.

7.3.3.9 Target Species Recorded During Hinterland Surveys Only

The following target species were recorded during hinterland surveys in the surrounding area but were not recorded during Vantage Point surveys, transects or any other species-specific survey at the proposed wind farm site.

7.3.3.9.1 Black-headed Gull

Black-headed gull was only recorded on hinterland surveys with seven records, across seven sites, between the 18th March 2020 at the 6th April 2022.

7.3.3.9.2 Goldeneye

Red-listed goldeneye was recorded on twelve occasions between the 26th November 2019 and the 24th January 2020, with all records logged at Lough Corrib. High counts of five birds occurred on the 27th November and the 24th January 2020.

7.3.3.9.3 Goosander

Amber-listed goosander was recorded once on the 27th November 2019 at Lough Corrib.

7.3.3.9.4 Great Crested Grebe

Amber-listed great crested grebe was recorded four times during winter 2019/2020 surveys, across three subsites of Lough Corrib. Three records involved single birds with one two-bird record. A further two records, all involving single birds, were recorded during the winter 2020/2021 season.

7.3.3.9.5 Great Northern Diver

Annex I protected great northern diver was recorded on 12 occasions across nine subsites of Lough Corrib between the 18th December 2019 and the 19th March 2020, with a maximum count of three birds recorded from Lough Corrib B on the 23rd January 2020.

7.3.3.9.6 Peregrine

Annex I protected peregrine was recorded once at Glengowla East on 23rd May 2020, involving a single bird flying over conifers to the south of the site.

7.3.3.9.7 Teal

Amber-listed teal was recorded on eight occasions across six sites, between the 26th November 2019 and 9th March 2022, with a maximum count of six birds at Lough Corrib (from Drumanauv) on the 4th February 2020.

7.3.3.9.8 Tufted Duck

Amber-listed tufted duck was recorded on 18 occasions, across nine sites between the 26th November and the 18th March 2022, with a maximum count of 17 birds from Lough Corrib L on the 4th February 2020.

7.3.3.9.9 Wigeon

Amber-listed wigeon was recorded once, involving two individuals seen at Lettercraffroe Lough & Lough Acogga on the 23rd January 2020.

7.4 AVIFAUNA EVALUATION

The basis of impact assessment should be a determination of which ecological resources within the zone of influence of the proposed development are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM 2019).

Table 7-21 outlines the key receptors selected for assessment and the rationale for same based on NRA guidance (NRA, 2009a); the overall importance or sensitivity evaluation for each key receptor, taken from guidance such as Percival 2007 is also illustrated.

Table 7-21: Avifauna Key Receptor Evaluations

Species	BoCCI	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Black-headed gull	Amber	County Importance	Not recorded within the flight activity survey area. No breeding or roosting was noted on site.	No	Medium
Brent goose	Amber	County Importance	Recorded once on the 21st May 2020 at VP2, involving a sighting of a lone bird seen in flight for eight seconds. The flightline occurred completely outside the flight activity survey area (the prescribed SNH buffer of a 500m radius around each of the proposed turbines).	No	Medium
Buzzard	Green	Local Importance (Higher Value)	Recorded within the flight activity survey area.	Yes	Low
Common gull	Amber	County Importance	Recorded within the flight activity survey area.	Yes	Medium
Common Sandpiper	Amber	County Importance	A single record was noted on the 25th March 2021 at VP4. As no further sightings were logged, this bird was likely on passage. A further five sightings were made during hinterland surveys.	Yes	Medium
Cormorant	Amber	County Importance	Recorded within the flight activity survey area.	Yes	Medium
Goldcrest	Amber	County Importance	Recorded as a non-target species during vantage point surveys.	Yes	Medium
Golden Plover	Annex I Red	International Importance	Recorded within the flight activity survey area.	Yes	Very High

Species	BoCCI	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Goldeneye	Red	National Importance	Not recorded within the flight activity survey area. Recorded on twelve occasions during hinterland surveys.	No	High
Goosander	Amber	County Importance	Not recorded within the flight activity survey area. Recorded once on hinterland surveys on the 27th November 2019 at Lough Corrib.	No	Medium
Great Black-backed gull	Green	Local Importance (Higher Value)	Recorded within the flight activity survey area.	Yes	Low
Great crested grebe	Amber	County Importance	Not recorded within the flight activity survey area. Recorded three times during hinterland surveys.	No	Medium
Great northern diver	Annex I Amber	International Importance	Not recorded within the flight activity survey area. Recorded on 12 occasions across nine subsites of Lough Corrib between the 18th December 2019 and the 19th March 2020. Included as a precaution because of its annex I protected status, combined with the fact that it is highly migratory and has the potential to pass through the site.	Yes	Very High
Greenfinch	Amber	County Importance	Recorded as a non-target species during vantage point surveys.	Yes	Medium
Greenshank	Green	Local Importance (Higher Value)	Recorded once during vantage point surveys at VP4 on the 30/10/20	Yes	Low
Grey heron	Green	Local Importance (Higher Value)	Recorded within the flight activity survey area.	Yes	Low
Grey wagtail	Red	National Importance	Not recorded within the flight activity survey area. Recorded on a hinterland survey once on the 8th July 2021 at Lough Adrehid.	No	High

Species	BoCCI	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Greylag goose	Amber	County Importance	Recorded three times during vantage point surveys and a further eight times on hinterland surveys. Birds in summer refer to a feral population, however, birds in winter may refer to genuine northern migrants.	Yes	Medium
Hen harrier	Annex I Amber	International Importance	Recorded within the flight activity survey area.	Yes	Very High
Herring gull	Amber	County Importance	Recorded within the flight activity survey area.	Yes	Medium
Kestrel	Red	National Importance	Recorded within the flight activity survey area.	Yes	High
Lesser black-backed gull	Amber	County Importance	Recorded within the flight activity survey area.	Yes	Medium
Linnet	Amber	County Importance	Recorded as a non-target species during vantage point surveys	Yes	Medium
Little grebe	Green	Local Importance (Higher Value)	Recorded on walkover surveys and as non-target species during VP surveys. Two juveniles were seen from VP2 on the 19th July 2021.	Yes	Low
Mallard	Amber	County Importance	Recorded within the flight activity survey area.	Yes	Medium
Meadow pipit	Red	National Importance	Recorded as a non-target species during vantage point surveys and during breeding walkovers.	Yes	High
Merlin	Annex I Amber	International Importance	Recorded within the flight activity survey area.	Yes	Very High
Moorhen	Green	Local Importance (Higher Value)	Not recorded within the flight activity survey area.	No	Low
Mute swan	Amber	County Importance	Recorded twice during vantage point surveys but not within flight activity survey area. Included as a precaution due to the number of records at hinterland sites.	Yes	Medium

Species	BoCCI	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Peregrine	Annex I Green	International Importance	Not recorded within the flight activity survey area. Recorded once at Glengowla East on 23rd May 2020, involving a single bird flying over conifers to the south of the site. Included as a precaution because of its annex I protected status as well as the fact that it is a species prone to hunting and dispersing over large expanses. It also has a propensity for nesting and hunting in upland sites, where suitable cliff faces occur.	Yes	Very High
Red grouse	Red	National Importance	A singing male, noted as a possible breeder, was noted on the 12th May 2020 from Transect 1 in the 100m+ distance band inside the flight activity survey area.	Yes	High
Red-breasted merganser	Amber	County Importance	Recorded three times during vantage point surveys and a further 15 times during hinterland surveys. Not recorded within the flight activity survey area but included as a precautionary measure.	Yes	Medium
Redwing	Red	National Importance	Recorded as a non-target species during vantage point surveys.	Yes	High
Sand martin	Amber	County Importance	Recorded as a non-target species during vantage point surveys as well as on hinterland surveys.	Yes	Medium
Skylark	Amber	County Importance	Recorded as a non-target species during vantage point surveys as well as on breeding walkover surveys.	Yes	Medium
Snipe	Red	National Importance	Recorded within the flight activity survey area.	Yes	High

Species	BoCCI	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Sparrowhawk	Green	Local Importance (Higher Value)	Two males and a female were seen displaying at VP2 on the 16th December 2019. A single bird was observed from VP3 on the 29th May 2020. No breeding within the site. Whilst breeding has not been proven in the greater area, it is likely to occur in coniferous plantations outside the site. There are no records however of the species within the flight activity survey area. Included as a precautionary measure.	Yes	Low
Starling	Amber	County Importance	Recorded as a non-target species during vantage point surveys.	Yes	Medium
Swallow	Amber	County Importance	Recorded during transect surveys and as non-target species during VP surveys	Yes	Medium
Teal	Amber	County Importance	Not recorded within the flight activity survey area.	No	Medium
Tufted duck	Amber	County Importance	Not recorded within the flight activity survey area.	No	Medium
Wheatear	Amber	County Importance	Recorded as a non-target species during vantage point surveys.	Yes	Medium
White-fronted goose	Annex I Amber	International Importance	Not recorded within the flight activity survey area. However, the species is included as a precautionary measure.	Yes	Very High
White-tailed eagle	Annex I Red	International Importance	Not recorded within the flight activity survey area. However, the species is included as a precautionary measure.	Yes	Very High
Whooper swan	Annex I Amber	International Importance	Not recorded within the flight activity survey area. However, the species is included as a precautionary measure.	Yes	Very High

Species	BoCCI	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Wigeon	Amber	County Importance	Not recorded within the flight activity survey area. Recorded once on a hinterland survey.	No	Medium
Willow Warbler	Amber	County Importance	Recorded as a non-target species during vantage point surveys.	Yes	Medium
Woodcock	Red	National Importance	Recorded thrice in the flight activity survey area, when observers flushed birds whilst en route to VPs 1 and 3. A further record comes from the hinterland site Lough Lurgan & Small Lakes.	Yes	High
Green-listed passerine sp.	Green	Local Importance (Low Value)	Recorded on various surveys throughout.	No	Negligible
Green-listed non-passerine sp.	Green	Local Importance (Low Value)	Recorded on various surveys throughout.	No	Negligible

No Very High to Medium sensitivity species were recorded within the 10km grid square encompassing the study area (M04) within the last 10 years (20012-2022) which were not already recorded within the study area over two years of dedicated field surveys.

Common scoter (High sensitivity species, last recorded in 2011), common tern (Very High sensitivity species, last recorded in 1972), Corncrake (Very High sensitivity species, last recorded in 1972), curlew (High sensitivity species, last recorded in 1972), kingfisher (Very High sensitivity species, last recorded in 2011), lapwing (High sensitivity species, last recorded in 2011), pochard (High sensitivity species, last recorded in 1984), short-eared owl (Very High sensitivity species, last recorded in 2011), and yellowhammer (High sensitivity species, last recorded in 1991) were recorded historically within the 10km grid square (encompassing the study area) and were not observed during two and half years of surveys and consequently are not listed as key receptors.

7.5 POTENTIAL EFFECTS ON AVIFAUNA

The effects of infrastructure such as wind farms on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the

surrounding land, the habitat affected and the numbers and species of birds present (Drewitt, A., and Langston, R., 2006). Developments such as wind farms in general have many effects on birds, including potential direct habitat loss and fragmentation, displacement due to disturbance, death, and injury due to collisions and disruption of local or migratory movements, with a consequent increase in energy expenditure (Drewitt, A., and Langston, R., 2008). However, the principal concerns in terms of adverse effects on birds are (1) disturbance / displacement, (2) collision, (3) habitat loss/change and (4) barriers to movement (Langston, R., 2010). Of these, only two are applicable during construction: 1) disturbance and / or displacement and 2) habitat loss/alteration. Habitat loss is the primary potential direct impact during constructions and although disturbance and / or displacement could be viewed as effective habitat loss, it is essentially indirect (SNH, 2017) and therefore covered under Indirect Impacts.

With regard to impacts on bird species, it is considered that the main potential source of impacts on avian fauna is the construction of the wind farm, particularly the construction of turbines and the associated road network.

The potential likely significant impact of wind turbines on birds may be considered as:

- Possible loss or deterioration of habitats; and
- Disturbance or displacement of birds.

Consideration of the survey data against
Table 7-21 indicates that eight 'Very High' sensitivity species have been recorded within the project study area:

- Golden plover (red-listed, annex I);
- Great northern diver (amber-listed, annex I);
- Hen harrier (amber-listed, annex I);
- Merlin (amber-listed, annex I);
- Peregrine (green-listed, annex I);
- White-fronted goose (amber-listed, annex I);
- White-tailed eagle (red-listed, annex I);
- Whooper swan (amber-listed, annex I).

Consideration of the survey data against
Table 7-21 indicates that six 'High' sensitivity species have been recorded within the project study area (main wind farm site and grid connection).

- Kestrel (red-listed);

- Meadow pipit (red-listed);
- Red grouse (red-listed);
- Redwing (red-listed);
- Snipe (red-listed);
- Woodcock (red-listed).

'Medium' sensitivity species recorded in the study area are also considered in this assessment, amounting to the following 18 species:

- Common gull (amber-listed);
- Common sandpiper (amber-listed);
- Cormorant (amber-listed);
- Goldcrest (amber-listed);
- Greenfinch (amber-listed);
- Greylag goose (amber-listed);
- Herring gull (amber-listed);
- Lesser black-backed gull (amber-listed);
- Linnet (amber-listed);
- Mallard (amber-listed);
- Mute swan (amber-listed);
- Red-breasted merganser (amber-listed);
- Sand martin (amber-listed);
- Skylark (amber-listed);
- Starling (amber-listed);
- Swallow (amber-listed);
- Wheatear (amber-listed);
- Willow warbler (amber-listed).

Six 'Low' sensitivity species are considered in this assessment:

- Buzzard (green-listed);
- Great black-backed gull (green-listed);
- Greenshank (green-listed);
- Grey heron (green-listed);
- Little grebe (green-listed);
- Sparrowhawk (green-listed).

7.5.1 Potential Construction Effects

The proposed grid connection shall be placed fully within existing roads and therefore there shall be no vegetation clearance or resultant habitat loss.

It is proposed that the turbine nacelles, tower hubs and rotor blades will be landed in Galway Port. From there, they will be transported to the Site via the R336 to Maam Cross and then the N59 east to the upgraded site entrance. There are four areas on the haul route (TDR) that will require works in third party lands.

Table 7-22: Areas of Works on Haul Route in Third Party Lands

No.	Area	ITM (Easting)	ITM (Northing)	Description
1	R336	497440	743302	A swept path assessment has been undertaken and indicates that loads will overrun and oversail the verge on the inside of the initial right bend where a load bearing surface should be laid. Loads will oversail into third party land on both sides of the road through the section. Vegetation will be cleared and utility poles potentially removed The clearance to the rock face on the inside of the second right bend may also be required.
2	R336	497060	742884	A swept path assessment has been undertaken and indicates that loads will overrun and oversail the verge on the outside of the bend where a load bearing surface should be laid and third party land will be required. Vegetation should be cleared. Loads will oversail the verge on the inside of the left bend.
3	R226/R340	496715	738300	Loads will turn right to continue on the R336 northbound at Loughaunweeny. A swept path assessment has been undertaken and indicates that loads will oversail both sides of the left bend on approach to the junction where third party land will be required to the west. Vegetation will be trimmed throughout. Loads will overrun and oversail into third party land on the outside of the junction where a load bearing surface will be laid and two road signs and trees should be removed. Loads will oversail the inside of the turn into third party land. Two road signs located on both sides of the road may require removal.
4	Baile na hAbhann	499618	722390	Loads will turn right to continue on the R336 northbound. A swept path assessment has been undertaken and indicates that loads will overrun and oversail into third party land to the west of the R336 where a load bearing surface will be laid and one utility pole may require removal.

It is noted that the construction of the proposed grid connection will progress in a sequential manner along the grid connection route and, therefore, the works in any one location will be of a temporary duration only. Because the works will progress relatively quickly along a linear corridor, any fugitive noise will be highly localised, temporary and are not expected to be of sufficient magnitude to create any disturbance or displacement impacts outside of areas contiguous or adjacent to the corridor. These adjacent habitats are widespread in the surrounding area therefore any resident species can easily move in response to any temporary disturbance.

7.5.1.1 Direct Effects: Habitat Loss or Alteration

Habitat loss can be direct through land take of breeding or foraging habitats for key species or indirect such as effective habitat loss through avoidance or disturbance due to the above factors. For direct effects during construction, land take of potential breeding or foraging habitat is the primary effect. This may constitute land stripping or vegetation removal affecting ground nesting birds, hedgerow removal or trimming if this takes place during the breeding season and loss of nesting or roosting sites such as trees. Some species (for example sand martin) may also be affected through material extraction requirements for construction purposes.

Effects on avifauna are to be assessed following guidance in Percival (2007). As outlined previously, key avian receptors have been assigned an evaluation of importance (or sensitivity) for assessment. Following this the significance of potential effects are rated as a product of both the magnitude of the predicted effect and the importance value (sensitivity) of the key receptor affected, based on the probability of the likely effect occurring.

The construction of the wind farm tracks, turbine foundations and hardstandings, the substation compound, temporary site compound and excavation of the on-site borrow pit will result in some habitat damage and loss. There is no forestry on site with very little to no trees/shrubs along the grid route, no felling or trimming is envisaged. During additional works along several areas of the TDR there will be trimming of hedgerows, treelines and foliage of woodland that overhang the TDR (in two locations) which will result in a temporary loss of foliage within these habitats. For further details on predicted habitat losses please see **Chapter 6: Biodiversity**.

For the purpose of the consideration of the potential effects on birds, species have been grouped into four categories namely passerines, birds of prey, game birds and waders/waterfowl.

A passerine is any bird of the order Passeriformes, which includes more than half of all bird species. A notable feature of passerines is the arrangement of their toes (three pointing forward and one back) which facilitates perching. The group are sometimes known as perching birds or, less accurately, as songbirds. Pigeon/dove belong to the order Columbidae comprised of birds with stout bodies, short necks, and slender bills which primarily feed on seed, fruits, and plants. Bird of prey are raptors that actively hunt other bird species. Gamebirds are birds that traditionally could be hunted, and terrestrial species often include pheasants and grouse, of which red grouse is an example. Waders are shorebirds with the majority of species eating small invertebrates picked out of mud or exposed soil. Waterfowl are swimming gamebird and are comprised of duck, geese, and swan.

Passerines/Non-target Species

The loss of habitat due to the construction of the project has the potential to affect some passerines. Habitat loss is inevitable in the development of any wind farm, especially when the development of turbine foundations and hard stands, access roads and other associated construction is considered. This can result in reduced feeding and nesting opportunities for birds. However, direct habitat loss by the development of wind farms tends to be relatively small (Drewitt and Langston 2006).

The main wind farm site is a predominantly lowland blanket bog (36.7%), a wet heath with exposed siliceous rock matrix (28.2%), and wet heath (20.8%). Other habitats on site are cutover/degraded blanket bog (5.4%), degraded lowland blanket bog/wet heath mosaic (4.8%), poor flush (1.6%), acid grassland (0.7%), dry heath/acid grassland mosaic (0.6%), existing tracks (0.5%), scrub (0.4%), dry heath (0.2%), eroding stream (0.1%), and wet grassland (<1%).

The proposed development will result in the loss of 0.35 Ha (39.5%) dry heath/acid grassland, 0.4 Ha (15.2%) poor flush, 0.05 Ha (13.1%) dry heath, 5.68 Ha (12.4%) wet heath/exposed siliceous rock, 0.01 Ha (11.2%) wet grassland, 0.08 Ha (11.1%) scrub, 2.99 Ha (8.9%) wet heath, 0.64 Ha (7.4%) cutover/degraded blanket bog, 0.08 Ha (6.7%) acid grassland, 3.95 Ha (6.7%) lowland blanket bog, and 0.35 Ha (4.5%) degraded lowland blanket bog/wet heath mosaic.

During additional works along several areas of the haul route there will be trimming of hedgerows, treelines and foliage of woodland that overhang the TDR and vegetation clearance (in four locations) which will result in very localised habitat loss of road side margin

habitat and temporary loss of foliage within these habitats that require trimming. There is therefore potential for a *Temporary Slight Effect* which is *Reversible*.

Goldcrest, greenfinch, linnet, and willow warbler (Percival sensitivity: Medium) typically use woodland bordering the site. Goldcrest and willow warbler typically forage within woodland and scrub, and as there is no suitable habitat for these species on site, and no resulting loss of suitable habitat, these species have a Percival effect of **Negligible** (< 1% population/ habitat lost). Linnet and greenfinch are seed-eaters, and although they do require trees and shrubs for breeding, they also need open spaces, with seed, for foraging. Both species would use a number of habitats on site, and to understand predicted effects the summed loss of these habitats have been assessed, rather than looking at each habitat type as a separate entity. Habitats on site which are suited to greenfinch and linnet are dry heath/acid grassland, acid grassland, wet grassland, scrub, and dry heath, which amount to 0.91 Ha, at a combined total loss of 8.35%, which is classed as a **Medium** Percival effect significance (5-20% of population/ habitat lost). Similar habitat is present at a number of TDR Nodes but is less suitable due to high levels of disturbance, however open habitats with seed sources, as well as scrub and tree cover exists commonly in the surround landscape. The resultant loss for these species is deemed to be a *Long-term Not Significant Effect* and *Reversible in a local context*.

Starling (Percival sensitivity: Medium) has only been recorded on site on just two occasions which suggests that habitats on site are largely unsuitable for the species. Starlings primarily forage in grassland, but could also use cavities in mature trees and buildings to nest in. There are no substantial trees on site, and grasslands here are largely wet and unsuitable. Percival impact significance is **Medium** (5-20% habitat loss for grassland habitats), however, not only does this not reflect the current rarity of the species on site, but there is also an abundance of grassland habitats in the surrounding area with ample trees and buildings for nesting, thus a *Temporary Imperceptible Effect* and *Reversible in a local context* is predicted for starling.

Redwing (Percival sensitivity: High) are winter visitors which may, very occasionally use the grassland habitats onsite to forage in. However, it must be noted that, again, this species was only recorded twice on-site during vantage point surveys, probably owing to overall foraging unsuitability on site. This species has been added to the red list due to the severity of long and short-term declines in its wintering population. Percival effect significance is **Low** (<1 % population/habitat lost), however, like starling, this does not consider the rarity of the species at the site in the pre-development state. Furthermore, suitable foraging habitat is generally abundant in agricultural landscapes which are commonplace in the surrounding landscape.

Thus, a *Temporary Imperceptible Effect* and *Reversible in a local context* is predicted for redwing.

Barn swallow, and sand martin (Percival significance: Medium) are aerial species which forage over open habitats. The entire wind farm site is open and there will be a predicted loss of 10.94% of such open habitats (note that scrub is included in this instance, as is a source of flying invertebrates, and is relatively low) on site. Loss of these habitats for these species will give rise to a *Temporary Imperceptible Effect Reversible in a local context.* Barn swallows require buildings for nesting, and sand martins typically nest in sand banks or occasionally crevices in walls or bridges. There is no suitable breeding habitat for either species on site. Percival effect significance is **Medium** (5-20% habitat loss for grassland habitats). It should also be noted that sand martin was noted just once, however swallow was noted on multiple occasions and probably breeds in nearby farm outhouses.

Meadow pipit (Percival sensitivity: High) and skylark (Percival sensitivity: Medium) are ground-nesting species which use open habitats with some low-lying vegetative cover (typically grassland and heath) for breeding and foraging. Meadow pipit were observed to be common in open areas throughout study area and evidence of breeding was ascertained. Similarly, skylark were also recorded displaying over open habitats on site. The entire wind farm site is open and there will be a predicted loss of 11.02% of such open habitats on site which will give rise to a *Short-term Slight Effect in a local context* which is *Reversible*. Percival effect significance is **Medium** (5-20% habitat loss for open habitats).

Wheatear (Percival sensitivity: Medium) is similar to meadow pipit and skylark in that it requires open habitats with low lying vegetative cover, but with interspersed rocky areas for perching and feeding. This species was recorded once during VP surveys and was not encountered during breeding walkover surveys, and hence it is considered to be an occasional passage migrant on site. The entire wind farm site is open and there will be a predicted loss of 11.02% of such open habitats on site which will give rise to a *Short-term Slight Effect in a local context* which is *Reversible*. Percival effect significance is **Medium** (5-20% habitat loss for open habitats).

Grey wagtail forage along watercourses and may nest in bridges and buildings. As such this species will not be subject to the direct effect of habitat loss.

It is not expected that the wind farm development will cause a reduction in the baseline population of passerines as the area of nesting/foraging habitat lost will be *Imperceptible to*

Slight. It is considered that the proposed effect of habitat loss will be a *Permanent Imperceptible to Not Significant Effect in a local context* which is *Reversible.* However, the trimming of vegetation along with the removal of scrub or felling of trees during the nesting season for birds could result in a *Localised Temporary Significant Reversible Effect* to nesting birds if it were to be undertaken during the bird nesting season (1st March – 31st of August).

Birds of Prey, Red Grouse and Waders/Waterfowl – Other Target Species

Table 7-23 below displays the direct effect character during construction as well as the significance of effects without the implementation of mitigation.

Table 7-23: Effect of habitat loss to target species

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
Buzzard (Low)	Observed during winter 2019/20 and summer 2020 VP surveys. No evidence of breeding was noted, however, the continued presence of the species during the summer 2020 season, indicates breeding is likely nearby. Buzzards require tall trees for nesting of which there are none on site, however the coniferous plantation adjacent to the eastern boundary of the site would provide ample nesting habitat. Buzzards typically require tall, mature trees for nesting, of which none occur on site. However, buzzards often feed in open areas, for example, the species regularly takes earthworms from short grassy habitats. Looking at a worst-case scenario, there will be a loss of 93.13 Ha of open habitat (10.94% of habitat total. However, conifer plantations and open habitats are common in the surrounding area. It is worth noting that buzzard densities in the west of Ireland are still low in comparison to other parts of the country, where tree cover is higher.	Magnitude of effects is assessed as **Medium** (5-20% population/habitat loss), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Slight Effect** (Criteria: EPA, 2022)
Common gull (Medium)	Observed three times during winter VP surveys and 18 times during summer VP survey. Most sightings (12) were of single birds, however there were four sightings of two birds, one record of four birds, and another single record of six birds. The high count of six birds were observed on the 21st April from VP2, and were noted as probable breeding pairs, and were observed landing by the lake shoreline near the VP. A single bird heard vocalising for the duration of surveys (six hours) from VP2 on the 19th July indicates a bird on territory. Breeding does not occur on-site with probable breeding birds from VP occurring approximately 1km to the southwest of the study area. There is no suitable breeding or foraging habitat for this species on site.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Common Sandpiper (Medium)	Observed once from VP4 on the 25th March 2021 outside the flight activity survey area. The early date and lack of subsequent sightings suggests that this bird was simply a migrant en-route to breeding grounds elsewhere. Common sandpiper breeds along fast-moving rivers and near lakes, loughs, and reservoirs. Although suitable breeding habitat	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003).

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	is visible within the viewshed of VP2, these waterbodies are outside the site boundary, thus there is no predicted habitat loss on site.	The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Cormorant (Medium)	Recorded seven times during winter VP surveys, and 20 times during summer VP surveys, with birds seen commuting between lakes in the area, as well as spending time on said lakes. There are no suitable water bodies on-site for the species and thus there will be no impact on cormorant from habitat loss.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Golden Plover (Very High)	Recorded five times during winter VP surveys, and four times during winter walkover surveys. Both winter 2020/21 VP survey records involved an unknown number of birds heard calling over VP3 on the 19th November 2020 and over VP1 on the 28th February 2021. On the 11th January 2022, two records of fifteen birds, presumably the same birds, occurred at VP1, initially flushed by a merlin – they flew for a combined 16 seconds at 0-10m. The final record occurred from VP4 on the 22nd February 2022 and involved three birds seen flying for five seconds at 10-20m.A high count of 20 birds were flushed from transect 2 on the 29th December 2021. Golden Plover breed on open upland habitats (which includes blanket bogs, heather dominated areas and marginal grasslands), where they are known to favour areas of short vegetation (<10 cm), particularly dominated by heather mixed with grasses (Parr, 1980; Whittingham et al., 2001). The species has a restricted range in Ireland, breeding in upland areas in the north-west, including Galway. No birds were noted during the breeding season, and birds appear to use the site and surrounding areas only in the non-breeding season, thus suggesting that habitats are not suitable for breeding birds on site.	Magnitude of effects is assessed as **Low** (1-5% habitat lost), species sensitivity is **Very High**, overall effect significance is **Medium** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Not Significant Effect** (Criteria: EPA, 2022)
Great Black-backed gull (Low)	Recorded ten times during winter VP surveys and nine times during summer VP surveys. Typically breeds in difficult-to-access coastal sites but there are also known inland colonies at lakes in Counties Galway and Mayo. The species does not breed on-site nor was it ever noted foraging on-site and there are no predicted habitat-loss related impacts	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
Great Northern Diver (Very High)	Recorded on 12 occasions across nine subsites of Lough Corrib on the 18th December 2019, during hinterland surveys. Great northern diver needs substantial waterbodies for foraging, and for landing/taking off, of which there are none on-site. This species was included as a precaution because of its Very High sensitivity status; however habitat loss is not deemed to be an issue on-site for this species.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Greenshank (Low)	Recorded once in winter on the 30th October 2020, flying over VP4 for 60 seconds. There are no indications of the species breeding and there is no suitable habitat on-site for overwintering/foraging, thus habitat loss is not deemed to be an issue for this species.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Grey heron (Low)	Recorded during winter and summer VP surveys. No evidence of breeding noted, however the presence of birds across all VPs during summer months, strongly suggests breeding occurs in the vicinity. Grey heron typically require tall trees, often conifers for breeding. Nesting occurs close to waterbodies. Neither of these requirements occur directly on-site. Conifers to the east of the site are unlikely to hold a heronry due the lack of any adjacent water bodies. Plantations to the north and west are more likely to hold colonies, although they were not noted on hinterland surveys or otherwise. Habitat loss is not deemed to be an issue for this species	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Greylag goose (Medium)	Recorded twice during winter VP surveys and once during summer VP surveys. This species does not breed on site, with no suitable waterbodies available. Furthermore, Irish breeding birds most likely refer to a feral population, however, in winter we receive migrants from wild Icelandic populations. Breeding birds like dense cover alongside water bodies, whereas wintering birds can be found in a wide range of habitats including estuaries, freshwater marshes, bogs, flooded fields as well as improved agricultural grassland and crop fields. There is no suitable habitat on-site for foraging and/or breeding greylag geese.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium** (conservative value), overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Hen harrier (Very High)	Eight sightings of this Annex I protected species were recorded between May and June 2020 at VPs 1 and 4. Note that all records in May occurred at VP1 on the same date – 24th May 2020. Likewise, all June records occurred at VP4 on the same date – 12th June 2020. No birds were recorded breeding on site and there were no additional observations of	Magnitude of effects is assessed as **Low** (5-20% of habitat lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
	the species during the two years of bird surveys within the larger flight activity survey area. Habitat on site is highly degraded and is deemed unlikely to be suitable for breeding hen harrier, and likewise, foraging is deemed suboptimal. Hen harrier typically forage over heath bog, low intensively farmed grassland with well-established hedgerows and areas of scrub (Irwin et al., 2012). Thus, taking this into consideration, there will be a 9.15 Ha loss of suitable foraging habitat on site, totalling 11.24%. However, similar foraging habitat for the species is common in the surrounding landscape.	boundary);species sensitivity is Very High, overall effect significance is **Medium** (Criteria: Percival, 2003). Significance here is worst case scenario. Habitats on site are highly degraded, and suitable habitat occurs throughout the wider landscape. Furthermore, hen harrier activity on site was only noted on two dates. Therefore, the proposed impact of habitat loss will be a **Long-term Slight Effect** (Criteria: EPA, 2022)
Herring gull (Medium)	Recorded on seven occasions during summer VP surveys at VPs 1, 2, and 3 and once during winter surveys. Although this species nests primarily on the coast, it is also known to nest on buildings, in larger towns and cities, and inland in Counties Donegal and Galway. Birds nesting inland occur near larger waterbodies, and thus there is no scope for breeding on-site. Habitats on site are also largely unsuitable for foraging birds.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Kestrel (High)	Kestrel was recorded on a regular basis during summer and winter VP surveys. A total of 2,333 seconds however was within the flight activity survey area (0.1% of the total VP observation time). Conifer plantation, dry heath, dry meadows, grassy verges, improved agricultural grassland, recently-felled woodland and scrub all provide potential breeding and foraging habitats - thus the species is rather flexible in its habitat needs. Although breeding was not proven, it is considered that kestrel probably breeds in the vicinity of the site. The site is certainly used by foraging birds. There will be the permanent loss of 0.55 Ha (6.68% of all habitat) of foraging habitat for Kestrel; habitat which is also present in the general area. There is no suitable breeding habitat on site.	Magnitude of effects is assessed as **Low** (5-20% of habitat lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is High, overall effect significance is **Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Slight Effect** (Criteria: EPA, 2022)
Lesser black-backed gull (Medium)	Recorded on five occasions between May and June of 2020, only. No evidence of breeding or foraging was noted on site. Typically, lesser black-backed gull is a coastal breeding species, however colonies do occur inland, alongside lakes, including in Co. Galway. Once a common breeding species at Lough Corrib, numbers have declined drastically in recent years, and now just small numbers occur. There is no suitable breeding habitat for this species on site and foraging habitat is suboptimal, at best.	Magnitude effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
Little grebe (Low)	Recorded six times during winter VP surveys, and eight times during summer VP surveys all of which came from VP2. Of the latter eight sightings, one record (19th July 2021) involved a sighting of two juveniles indicating successful breeding. It must be noted, however, that lakes visible from VP2 are outside the site boundary and no such waterbodies, suitable for little grebe are available on site, thus there are no predicted habitat loss implications for little grebe at Tullaghboy.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Mallard (Medium)	Recorded 17 times during winter VP surveys, and a further 14 times during summer VP surveys. There is no sufficient waterbody on-site to support foraging or breeding of the species.	Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Merlin (Very High)	Recorded on seven occasions during winter VP surveys, included a male seen hunting over bog for a total of 420 seconds, from VP4. A further six sightings plus an additional unconfirmed sighting were made during summer VP surveys. However only 116 second over the 2.5 years of surveys were inside the flight activity survey area (500m buffer from turbine) or 0.005% of the total VP observation time. Of this the species was all below the rotor sweep zone. No live sightings or signs of the species were detected during targeted merlin breeding surveys. Merlin have largely shifted to nesting in 10 year+ conifer plantations, using old corvid nests, and require open ground (heath, natural grassland, bog, etc) for hunting. Thus, there is no predicted loss of breeding habitat for the species. Loss of open habitat on site amounts to 10.27 Ha or 10.94%.	Magnitude of effects is assessed as **Low** (5-20% of habitat lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary), species sensitivity is **Very High**, overall effect significance is **Medium** (Criteria: Percival, 2003). Based on the infrequent use of the site by the species, the low loss (in comparison to that of the wider area) of open habitat area (10.27Ha), and the fact that similar habitat exists in the site surrounds, the proposed impact of habitat loss will be **Long-term Slight Effect** (Criteria: EPA, 2022)
Moorhen (Low)	Recorded on seven occasions during summer VP surveys, all of which came from VP2. A further seven records occurred during winter VP surveys. A record of three birds on the 26th June involved an adult and two chicks. Moorhen require waterbodies large enough to provide sufficient feeding, as well as some cover for breeding. Although two lakes can be viewed from VP2, these are not within the site boundary, thus there is no scope for the species to occur on site (apart from flyovers).	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
		Long-term Imperceptible Effect (Criteria: EPA, 2022)
Mute swan (Medium)	Recorded once during winter VP surveys with an additional summer VP sighting, both of which came from VP2 from waterbodies outside the site. Mute swans require substantial waterbodies, of which there are none on site and thus there are no envisaged effects from habitat loss on site.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Peregrine (Very High)	Only recorded once on a hinterland survey, south of the site. Included in the assessment as a precaution, owing to its Very High sensitivity status. Peregrines require tall cliff-faces for breeding, of which there are none on site. Peregrines are aerial hunters which dive on prey from above and as such are not strictly limited to any particular habitat, instead they require sufficient numbers of avian prey. As such, there are no envisaged habitat loss impacts on the species.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Red grouse (High)	A single stationary sighting occurred from VP1 on 28th October 2019 and a single grouse was flushed from transect 3 on the 28th October 2021. An additional sighting occurred at VP3 on 20th January 2021 when a single bird was flushed and seen in flight for five seconds in the 0-10m height band. During targeted red grouse surveys on the 17th March 2021, there were two sightings of red grouse. A roost site along transect one was located in a section of lesser sheep-grazing among bog. A single roost with faecal matter was located along transect two on Curraun Hill in bog. A small number of fresh pellets were noted along transect one with a single pellet also noted along transect two. A feather spot (approximately 20) was noted along transect two, with two feathers noted at transect three. Requires heather for both food and shelter/nesting, and thus can be found in heath and bog habitats, where heather is abundant (where overgrazing isn't an issue).	Magnitude off effects is assessed as **Low** (5-20% of habitat lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary), species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival, 2003). Actual habitat loss value is low (9.06 Ha), especially considering this habitat is common in the surrounding landscape. The proposed impact of habitat loss will be a **Long-term Slight Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
Red-breasted merganser (Medium)	A total of three sightings were made during summer VP surveys. All sightings were outside the flight activity survey area and rotor sweep zone. Red-breasted merganser requires large waterbodies with fish, of which there are none on site. Thus, there are no envisaged habitat loss impacts on the species on site.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Snipe (High)	Recorded on 19 occasions during winter VP surveys, twice during summer VP surveys, 15 times during winter walkovers, and thrice during summer walkovers, with a single bird heard drumming/displaying from transect 2 on the 30th June. Targeted breeding surveys yielded two records of single birds flushed from transect 1 on 07/07/20 and again on 30/05/21. Snipe require soft, wet ground with cover for both feeding and nesting. Overgrazing is an issue on-site as is the case in most upland areas of Ireland. This limits snipe densities. Although drumming was heard just once, it is likely that the species breeds in low densities in wetter parts of the site. Predicted loss of wet habitats on site amounts to 9.08 Ha or 11.06%.	Magnitude of effects is assessed as **Medium** (5-20% habitat lost), species sensitivity is **High**, overall effect significance is **High** (Criteria: Percival, 2003). Due to a presumed very low density of birds, coupled with the fact that suitable habitat occurs outside the site, the proposed impact of habitat loss will be a **Long-term Slight Effect** (Criteria: EPA, 2022)
Sparrowhawk (Low)	Recorded once during winter VP surveys and once during summer VP surveys. Of significance is the single winter sighting, which occurred from VP on the 16th December 2019, which involved three birds: a male displaying with a second male and a female was seen below briefly. Requires mature trees for nesting and are commonly found in coniferous plantations. A second key requirement is an abundance of small birds, including meadow pipit and skylark. Both components are present on site and thus, although breeding by sparrowhawk has not been proven, it is highly plausible that it breeds close to, but not on site, given its secretive nature. There are no predicted effects of habitat loss on the species.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
White-fronted goose (Very High)	Recorded once on the 28th October 2019, when a lone white-fronted goose or small family group gave three single calls over an approximate sixty second period, flying low over forestry behind the observer at VP1. No birds were noted using the site and the species does not breed in Ireland, thus there is no predicted habitat loss impact on the species.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Direct Effect Character	Significance without mitigation
White-tailed eagle (Very High)	Noted once, at VP1 on 28th February 2021, soaring over a hill behind Lough Boffin in the >185m height band for 120 seconds. Two white-tailed eagles, mobbed by two ravens were noted on the 30th October 2020 from Transect 1 in the 100m+ flight band, flying northwest behind Tullaghboy Hill, before flying across the site. Requires mature trees near substantial waterbodies for nesting and thus does not breed on site.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Whooper Swan (Very High)	Not recorded on site, but recorded on twelve occasions during hinterland surveys, and once from VP2 on the 10th February 2022, when four birds were noted feeding on the lake within sight of the VP, for the duration of the survey period of three hours. Included in the assessment as a precautionary, owing to its Very High sensitivity status. Requires substantial waterbodies often with nearby grass/crop fields for grazing, and thus does not occur on site.	Magnitude of effects is assessed as **Negligible** (<1% habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). The proposed impact of habitat loss will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022)
Woodcock (High)	There are no recorded flightlines for this species however, two records come from January 2020 of birds seen en-route to vantage points. A single bird was flushed from the track at 07:58 on the way to VP1 on 21st January 2020. The other bird was flushed en-route to VP3 on the 22nd January 2020. An additional bird was flushed en route to VP1 on the 21st November 2021 and was seen in flight from 0-10m for three seconds. Requires woodland for nesting - often in upland or remote areas. Coniferous plantations are known breeding sites for the species in Ireland. Such habitat occurs just outside the site but not on site, thus there is no envisaged habitat loss for breeding woodcock. Typically requires damp ground for feeding, where it probes for earthworms and other invertebrates. Predicted loss of wet habitats on site amounts to 9.08 Ha or 11.06%.	Magnitude effects is assessed as **Medium** (5-20% habitat lost), species sensitivity is **High**, overall effect significance is **High** (Criteria: Percival, 2003). Owing to the high proportion of damp feeding habitat in the general surrounds, the proposed impact of habitat loss will be a **Long-term Slight Effect** (Criteria: EPA, 2022)

7.5.1.2 *Indirect Effects: Disturbance and Displacement*

High levels of activity and disturbance during construction may cause birds to vacate territories close to works, especially for species vulnerable to disturbance. The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss (Drewitt, A. L. and Langston, R. H., 2006). If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur. Examples of causes of disturbance during construction which may lead to displacement are vehicle and personnel movements, vibration and noise impacts from the construction process and visual intrusion (Drewitt, A. L. and Langston, R. H., 2006).

Additional effects may occur during the construction process due to road works along turbine delivery routes, the laying of cabling, the placement of underground cabling, re-working structures such as bridges along the haul route, and excavation of materials.

Studies both during construction (Pearce-Higgins *et al*., 2012) and during operational effects of wind farms (Pearce-Higgins et al., 2009) have shown that certain species (e.g. large wading species) can be affected particularly as a result of construction impacts (in that the affected species fail to recover to pre-construction densities).

Indirect effects may occur on species linked to aquatic habitats through pollution events, sediment laden runoff and dust deposition.

Table 7-24: Indirect Construction Effects on Avifauna

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Buzzard (Low)	Observed during winter 2019/20 and summer 2020 VP surveys. No evidence of breeding was noted, however the continued presence of the species during the summer 2020 season, indicates it is likely nearby. Possible noise/visual intrusion disturbance to foraging birds within the site.	Sensitivity: **Low**. Magnitude assessed as **Low**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022).
Common gull (Medium)	Observed three times during winter VP surveys and 18 times during summer VP survey. Most sightings (12) were of single birds, however there were four sightings of two birds, one record of four birds, and another single record of six birds. The high count of six birds were observed on the 21st April from VP2, and were noted as probable breeding pairs, and were observed landing by the lake shoreline near the VP. A single bird heard vocalising for the duration of surveys (six hours) from VP2 on the 19th July indicates a bird in its territory. Birds were not noted breeding on site nor were they seen foraging on site, thus noise or visual disturbance is unlikely.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022).
Common Sandpiper (Medium)	Observed once from VP4 on the 25th March 2021 outside the flight activity survey area. The early date and lack of subsequent sightings suggests that this bird was simply a migrant en-route to breeding grounds elsewhere. Common sandpiper breeds along fast-moving rivers and near lakes, loughs, and reservoirs. The rarity of this species minimises any possibilities of indirect impact.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Cormorant (Medium)	Recorded seven times during winter VP surveys, and 20 times during summer VP surveys, with birds seen commuting between lakes in the area, as well as spending time on said lakes. There are no suitable water bodies on site for the species and thus there will be no impact on cormorant from habitat loss. There are no suitable aquatic foraging habitats present within the site, precluding any possible noise/visual intrusion disturbance to this species.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022).
Golden Plover (Very High)	Recorded five times during winter VP surveys, and four times during winter walkover surveys. Both winter 2020/21 VP survey records involved an unknown number of birds heard calling over VP3 on the 19th November 2020 and over VP1 on the 28th February 2021. On the 11th January 2022, two records of fifteen birds, presumably the same birds, occurred at VP1, initially flushed by a merlin – they flew for a combined 16 seconds at 0-10m. The final record occurred from Vp4 on the 22nd February 2022 and involved three birds seen flying for five seconds at 10-20m.A high count of 20 birds were flushed from transect 2 on the 29th December 2021. Golden Plover breed on open upland habitats (which includes blanket bogs, heather dominated areas and marginal grasslands), where they are known to favour areas of short vegetation (<10 cm), particularly dominated by heather mixed with grasses (Parr, 1980; Whittingham et al., 2001). The species has a restricted range in Ireland, breeding in upland areas in the north-west, including Galway. No birds were noted during the breeding season, and birds appear to use to site and surrounding areas only in the non-breeding season.	Sensitivity: **Very High**. Magnitude assessed as **Low**. Overall significance assessed as **Medium**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Not Significant Effect** (Criteria: EPA, 2022).
Great Black-backed gull (Low)	Recorded ten times during winter VP surveys and nine times during summer VP surveys. Typically breeds in difficult-to-access coastal sites but there are also known inland colonies at lakes in Counties Galway and Mayo. Habitat surveys indicate that there is limited foraging habitat within the proposed wind farm site for gulls.	Sensitivity: **Low**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Great Northern Diver (Very High)	Recorded at two subsites of Lough Corrib on the 18th December 2019, during hinterland surveys. Great northern diver needs substantial waterbodies for foraging, of which there are none on-site. This species was included as a precaution because of its Very High sensitivity status.	Sensitivity: **Very High**. Magnitude assessed as **Negligible**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Greenshank (Low)	Recorded once in winter on 30th October 2020, flying over VP4 for 60 seconds outside the flight activity survey area. There are no indications of the species breeding and there is no suitable habitat on-site for overwintering.	Sensitivity: **Low**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Grey heron (Low)	Recorded during winter and summer VP surveys. No evidence of breeding noted, however the presence of birds across all VPs during summer months, strongly suggests breeding occurs in the greater area outside the site. Grey heron typically require tall trees, often conifers for breeding. Nesting occurs close to waterbodies.	Sensitivity: **Low**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Greylag goose (Medium)	Recorded twice during winter VP surveys and once during summer VP surveys. This species does not breed on site, with no suitable waterbodies available. Furthermore, Irish breeding birds most likely refer to a feral population, however, in winter we received migrants from wild northern populations. Breeding birds like dense cover alongside water bodies, whereas wintering birds can be found in a wide range of habitats including estuaries, freshwater marshes, bogs, flooded fields as well as improved agricultural grassland and crop fields.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Hen harrier (Very High)	Eight sightings of this Annex I protected species were recorded between May and June 2020 at VPs 1 and 4. Note that all records in May occurred at VP1 on the same date – 24th May 2020. Likewise, all June records occurred at VP4 on the same date – 12th June 2020. No birds were recorded breeding on site and there were no additional observations of the species during the two years of bird surveys within the larger flight activity survey area. There is no indication the species breeds on site. Potential for disturbance during construction works for birds hunting within site or breeding/hunting nearby the site.	Sensitivity: **Very High**. Magnitude assessed as **Low**. Overall significance assessed as **Medium**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022)
Herring gull (Medium)	Recorded on seven occasions during summer VP surveys at VPs 1, 2, and 3 and once during winter surveys. Although this species nests primarily on the coast, it is also known to nest on buildings, in larger towns and cities, and inland in Counties Donegal and Galway. Birds nesting inland occur near larger waterbodies, and thus there is no scope for breeding on-site. Habitat surveys also indicate that there is limited foraging habitat within the proposed wind farm site for gulls	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Kestrel (High)	Kestrel was recorded on a regular basis during summer and winter VP surveys. A total of 2,333 seconds however was within the flight activity survey area (0.1% of the total VP observation time). Conifer plantation, dry heath, dry meadows, and grassy verges improved agricultural grassland, recently felled woodland and scrub all provide potential breeding and foraging habitats. Although breeding was not proven, it is highly likely that kestrel breeds on or in the vicinity of the site. The site is certainly used by foraging birds. Possible noise/visual intrusion disturbance to foraging/breeding birds within the site.	Sensitivity: **High**. Magnitude assessed as **Medium**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022)
Lesser black-backed gull (Medium)	Recorded on five occasions between May and June of 2020, only. No evidence of breeding was noted on site. Typically, lesser black-backed gull is a coastal breeding species however colonies do occur inland, alongside lakes, including in Co. Galway. Once a common breeding species at Lough Corrib, numbers have declined drastically in recent years, and now just small numbers occur. There is no suitable breeding habitat for this species on site, with foraging suboptimal to non-existent.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022).
Linnet (Medium)	Recorded five times as an additional species during vantage point surveys, with a high count of ten birds in flight over VP4 on the 16th February 2021. Another record of three birds in flight comes from VP2 on the 26th June 2021. Linnet is a seed-eating species and can be found in a variety of open habitats where seeds are plentiful, including heath, grassland, scrub, and wasteland. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Medium**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Short-term Not Significant Effect** (Criteria: EPA, 2022).
Little grebe (Low)	Recorded six times during winter VP surveys, and eight times during summer VP surveys all of which came from VP2. Of the latter eight sightings, one record (19th July 2021) involved a sighting of two juveniles indicating successful breeding. It must be noted, however, that lakes visible from VP2 are outside the site boundary and no such waterbodies, suitable for little grebe are available on site.	Sensitivity: **Low**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Mallard (Medium)	Recorded 17 times during winter VP surveys, and a further 14 times during summer VP surveys. There is no sufficient waterbody on-site to support foraging or breeding of the species.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term**

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
		Imperceptible Effect (Criteria: EPA, 2022)
Meadow pipit (High)	Recorded frequently during winter and summer VP surveys (64 records in total), as well as both breeding (62 records) and winter walkovers (32 records). Birds were recorded from all VPs and transects with multiple counts of 60+. Breeding was also proven on site. This species requires open habitats for breeding and feeding and prefers moorland, heath, and grassland. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **High**, magnitude **Low**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022).
Merlin (Very High)	Recorded on seven occasions during winter VP surveys, included a male seen hunting over bog for a total of 420 seconds, from VP4. A further six sightings plus an additional unconfirmed sighting were made during summer VP surveys. However only 116 second over the 2.5 years of surveys were inside the flight activity survey area (500m buffer from turbine) or 0.005% of the total VP observation time. Of this the species was all below the rotor sweep zone. No live sightings or signs of the species were detected during targeted merlin breeding surveys. Merlin have largely shifted to nesting in 10 year+ conifer plantations, using old corvid nests, and require open ground (heath, natural grassland, bog, etc) for hunting. Hunting merlin may be disturbed by felling and construction activities.	Sensitivity: **Very High**. Magnitude assessed as **Low**. Overall significance assessed as **Very Medium**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022)
Moorhen (Low)	Recorded on seven occasions during summer VP surveys, all of which came from VP2. A further seven records occurred during winter VP surveys. A record of three birds on the 26th June involved an adult and two chicks. Moorhen require waterbodies large enough to provide sufficient feeding, as well as some cover for breeding. Although two lakes can be viewed from VP2, these are not within the site boundary, thus there is no scope for the species to occur on site (apart from flyovers).	Sensitivity: **Low**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Mute swan (Medium)	Recorded once during winter VP surveys with an additional summer VP sighting, both of which came from VP2. There were no sightings of the species flying within the rotor sweep zone within the flight activity survey area during the 2.5 years of surveys. Mute swans require substantial waterbodies, of which there are none on site.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Peregrine (Very High)	Only recorded once on a hinterland survey, south (outside) of the site with no records during the 2.5 years of VPs. Included in the assessment as a precaution, owing to its Very High sensitivity status. Peregrines require tall cliff-faces for breeding, of which there are none on site. Peregrines are aerial hunters which dive on prey from above and as such are not strictly limited to any particular habitat, instead they require sufficient numbers of avian prey. Disturbance unlikely, as the species adapts to disturbance-prone urban habitats easily and also recorded in low densities.	Sensitivity: **Very High**. Magnitude assessed as **Negligible**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Red grouse (High)	A single stationary sighting occurred from VP1 on 28th October 2019 and a single grouse was flushed from transect 3 on the 28th October 2021. An additional sighting occurred at VP3 on 20th January 2021 when a single bird was flushed and seen in flight for five seconds in the 0-10m height band. During targeted red grouse surveys on the 17th March 2021, there were two sightings of red grouse. A roost site along transect one was located in a section of lesser sheep-grazing among bog. A single roost with faecal matter was located along transect two on Curraun Hill in bog. A small number of fresh pellets were noted along transect one with a single pellet also noted along transect two. A feather spot (approximately 20) was noted along transect two, with two feathers noted at transect three. Requires heather for both food and shelter/nesting, and thus can be found in heath and bog habitats, where heather is abundant (where overgrazing isn't an issue). Species foraging within the site may be disturbed whilst the species foraging/nesting nearby the site may be disturbed by noise during construction and felling activities.	Sensitivity: **High**. Magnitude assessed as **Low**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022).
Red-breasted merganser (Medium)	A total of three sightings were made during summer VP surveys. All sightings were outside the flight activity survey area and rotor sweep zone. Red-breasted merganser requires large waterbodies with fish, of which there are none on site.	Sensitivity: **Medium**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Redwing (High)	Recorded twice during winter VP surveys; redwing breeds in Scandinavia (ssp *iliacus*) and Iceland (ssp *coburni*) and winters in Ireland and beyond where it favours woodlands and open areas, including agricultural grassland or any habitat which has short turf where it can find worms and other invertebrates. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **High**; magnitude **Low** Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022).
Sand martin (Medium)	Recorded once during summer VP surveys. Sand martins require soft banks of mud or sand or even man-made crevices for breeding, and typically seek out these locations near water. Neither of these habitat requirements are met on site. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Medium**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022).
Skylark (Medium)	Recorded during winter and summer VP surveys as well as breeding and winter walkover surveys. Multiple males were heard singing and holding territory on site. Skylark requires open natural or semi-natural areas for feeding and nesting. Habitats include grasslands, heath, and stubble fields in winter. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Medium**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022).
Snipe (High)	Recorded on 19 occasions during winter VP surveys, twice during summer VP surveys, 15 times during winter walkovers, and three times during summer walkovers, with a single bird heard drumming/displaying from transect 2 on the 30th June 2021. Targeted breeding surveys yielded two records of single birds flushed from transect 1 on 07/07/20 and again on 30/05/21. Snipe require soft, wet ground with cover for both feeding and nesting. Overgrazing is an issue on-site as is the case in most upland areas of Ireland. This limits snipe densities. Although drumming was heard just once, it is likely that the species breeds in low densities. During felling/construction activities, this species may be disturbed whilst resting/foraging within the site or nesting nearby.	Sensitivity: **Medium**. Magnitude assessed as **Low**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022)

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Sparrowhawk (Low)	Recorded once during winter VP surveys and once during summer VP surveys. Of significance is the single winter sighting, which occurred from VP on the 16th December 2019, which involved three birds: a male displaying with a second male and a female was seen below briefly. Requires mature trees for nesting and are commonly found in coniferous plantations. A second key requirement is an abundance of small birds, including meadow pipit and skylark. Both components are present on site and thus, although breeding by sparrowhawk has not been proven, it is highly plausible that it breeds on site, given its secretive nature. Possible noise/visual intrusion disturbance to hunting/breeding birds within the site.	Sensitivity: **Low**. Magnitude assessed as **Negligible**. Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Starling (Medium)	Recorded at VP2 on the 17th September 2020, involving six birds calling in flight, and again at VP2 on the 10th October 2021. Starlings are not typically found in upland areas, and are more associated with man, being found in parks, gardens, and towns and cities, where they largely nest in crevices in buildings and trees. It is highly unlikely that the species does or will breed on site. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Medium**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Not Significant Effect** (Criteria: EPA, 2022).
Swallow (Medium)	Recorded on fifteen occasions during summer VP surveys as well as during breeding walkovers. Swallows need barns and buildings for nesting and hunt insects on the wing in open space habitats. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Medium**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Not Significant Effect** (Criteria: EPA, 2022).
Wheatear (Medium)	Recorded once during summer VP surveys, at VP2 on the 21st April 2021, involving a single male seen perched atop a rock. Requires open areas with short vegetation and scattered rocks for breeding. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Low**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Short-term Not Significant Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
White-fronted goose (Very High)	Recorded once the 28th October 2019, when a lone white-fronted goose or small family group gave three single calls over an approximate sixty second period, flying low over forestry behind the observer at VP1. No birds were noted using the site and the species does not breed in Ireland.	Sensitivity: **Very High**. Magnitude assessed as **Negligible**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
White-tailed eagle (Very High)	Noted once, at VP1 on 28th February 2021, soaring over a hill behind Lough Boffin in the >185m height band for 120 seconds (outside the flight activity survey area). Two white-tailed eagles, mobbed by two ravens were noted on the 30th October 2020 from Transect 1 in the 100m+ flight band, flying northwest behind Tullaghboy Hill, before flying across the site. Requires mature trees near substantial waterbodies for nesting and thus does not breed on site.	Sensitivity: **Very High**. Magnitude assessed as **Negligible**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Whooper Swan (Very High)	Not recorded on site, but recorded on twelve occasions during hinterland surveys, and once from VP2 on the 10th February 2022, when four birds were noted feeding on the lake within sight of the VP, for the duration of the survey period of three hours. Included in the assessment as a precautionary, owing to its Very High sensitivity status. Requires substantial waterbodies often with nearby grass/crop fields for grazing, and thus does not occur on site.	Sensitivity: **Very High**. Magnitude assessed as **Negligible.** Overall significance assessed as **Very Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022)
Willow Warbler (Medium)	Recorded on three occasions during summer VP surveys, all of which came from VP1. All records involved vocalising birds which indicates breeding is likely on site. Requires woodland for breeding and is one of the few species which has adapted to breeding in the ever-growing abundance of coniferous plantations. Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species.	Sensitivity: **Medium**; magnitude **Negligible**. Overall impact is **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Construction Indirect Effect Character	Significance without mitigation
Woodcock (High)	There are no recorded flightlines for this species however, two records come from January 2020 of birds seen en-route to vantage points. A single bird was flushed from the track at 07:58 on way to VP1 on 21st January 2020. The other bird was flushed en-route to VP3 on the 22nd January 2020. An additional bird was flushed en route to VP1 on the 21st November 2021 and was seen in flight from 0-10m for three seconds. Requires woodland for nesting - often in upland or remote areas. Coniferous plantations are known breeding sites for the species in Ireland. During felling/construction activities, this species may be disturbed whilst resting/foraging within the site or nesting nearby.	Sensitivity: **High**. Magnitude assessed as **Low**. Overall significance assessed as **Low**. (Criteria: Percival, 2003). Disturbance and/or displacement will be a **Temporary to Short-term Slight Effect** (Criteria: EPA, 2022)

7.5.2 Potential Operational Effects

7.5.2.1 *Direct Effects: Collision Risk*

Studies on operational impacts of wind farms (Pearce-Higgins *et al*., 2009) have shown that certain species do exhibit levels of turbine avoidance during operational phases which may be extrapolated to reductions in breeding bird densities; however, this may not be as significant as previously thought, certainly in comparison to impacts during construction (Pearce-Higgins *et al*., 2012). It seems that there is little evidence for consistent post-construction population declines in any species, suggesting for the first time that wind farm construction can have greater effects on birds than wind farm operation; this is supported in the literature (Devereux *et al*., 2008).

A recent study on the effects of wind turbines on the distribution of wintering farmland birds (Devereux *et al*., 2008) did not find any consistent patterns of turbine avoidance across the species groups studied (corvids, seed-eaters, gamebirds, and skylark).

The primary cause of direct effects on birds during the operational phase of a development is collision risk. Collision risk behavioural observations of birds in relation to operational wind farms provide the basis of studies on collision risk. Fixed point observations of flight behaviour, flight lines into, through and out of the area and information about the birds' use of the area help to inform the environmental evaluation of the proposed wind farm development. Bird mortality may result from potential bird collision with turbine structures or turbine blades.

Not all bird species are equally susceptible to collision, and some species suffer proportionately high levels of collision mortality (Drewitt and Langston, 2008). Morphology, physical flight characteristics and differences in vision are all influencing factors. Martin and Shaw (2010) suggest that it is the characteristics of the section of a birds visual field that projects forward and hence 'looks' that are the key factors.

In some species the vertical extent of the forward binocular vision is reduced and therefore the bird is rendered blind, if, whilst in the process of flying, it undertakes behaviour such as the detection of conspecifics, remote food sources, etc. (Martin, 2011 and Martin and Shaw, 2010).

Other species have reduced fovea, are emmetropic (default focus is distant) or may contain blind spots in their field of vision (as an evolutionary trait) which may cause susceptibility to collision. Flight height or the flight heights which birds habitually use along either migration or local flight paths is also an influencing factor. Relative size and high wing loading (or low manoeuvrability) are influencing factors as larger birds with poor manoeuvrability are generally perceived as at greater risk of collision with structures (see Brown *et al.,* 1992, quoted in Drewitt and Langston, 2006). Various species therefore exhibit different morphological and behavioural attributes which may contribute to collision risk.

Recent studies show that modern, larger multi-MW turbines show comparable fatality estimates with older generation models and expected increases in fatalities due to increases in rotor surface are not as expected, possibly due to increased altitude, increased distance between turbines and slower rotation speeds (Krijgsveld *et al.*, 2009). Appraisal of collision risk for the proposed development is based on a predicted rotor envelope of 23-185m (see **Chapter 2: Project Description**).

Relatively little is known about collision as a threat to birds. One problem is that most studies rely on the number of corpses found, but this can be extremely unreliable, since it is known that corpses are quickly removed by predators. At a wind farm site in Co. Tipperary in 2011, it was found that 72% of bird corpses left out were removed after five days. At this site in Co. Tipperary in 2012, scavengers were present at a bird corpse within forty-five minutes of it being placed in the vicinity of a turbine (J. Kearney principal ecologist FT, per. comm. 2022).

The colour, mode, intensity, and density of lighting has been shown to influence the degree to which birds (specifically, nocturnally migrating passerines) are attracted to wind turbines at night. Studies have shown that red lighting is more attractive to birds, and that steady burning

lights are more attractive than flashing ones, while structures with no lighting were the least attractive (Kerlinger et al., 2010; Gehring et al., 2009). The directional intensity of lighting is also a factor in reducing the attraction of birds. As such, specification of aviation obstruction lighting to minimise effects on birds is included under operational mitigation measures.

7.5.2.2 *Collision Risk Model Analysis*

The Collision Risk Model Report (see **Appendix 7.2**) presents the results of collision risk modelling for the proposed Tullaghmore Wind Farm, Co. Galway. This modelling used data from vantage point surveys carried out in the winters of 2019/20, 2020/21, and 2021/22, as well as the summers of 2020 and 2021. The modelling was carried out using the Scottish Natural Heritage Collision Risk Model (Scottish Natural Heritage, 2000; Band *et al*., 2007 and Band, 2012). The bird occupancy method (Scottish Natural Heritage, 2000) was used to calculate the number of bird transits through the rotors, and the spreadsheet accompanying the Scottish Natural Heritage report was used to calculate collision probabilities for birds transiting through the rotors.

The following target species were recorded during vantage point surveys: brent goose, common gull, common sandpiper, cormorant, golden plover, great black-backed gull, greenshank, grey heron, greylag goose, hen harrier, herring gull, kestrel, lesser black-backed gull, little grebe, mallard, merlin, moorhen, mute swan, red grouse, red -breasted merganser, snipe, sparrowhawk, white-fronted goose, white-tailed eagle, whooper swan, woodcock.

Twelve species were selected for collision risk modelling: buzzard, common gull, cormorant, great black-backed gull, grey heron, greylag goose, hen harrier, herring gull, kestrel, lesser black-backed gull, mallard, and snipe. These species have been selected because they were recorded within the 500m buffers of the proposed turbines (the flight activity survey area) and at rotor swept heights, and are of conservation concern: i.e., they are red or amber-listed in Birds of Conservation Concern Ireland 2020-2026 (Gilbert et al., 2021), and/or are listed on Annex I of the Birds Directive (2009/147/EC) or green-listed and sensitive to wind farm developments (i.e., buzzard). For all the other species recorded but not included for collision risk modelling, the effective collision risk can be assumed to be zero.

As the proposed grid connection will be buried underground there is no resultant collision risk associated with this element of the wind farm project.

Passerines

Collision by resident passerines is not considered likely to be a significant issue as their flight activity is generally well below the height of rotor blades and the proposed impact of collision risk will be a *Long-term Imperceptible Reversible Effect*.

Non-Passerines

Potential collision risk to non-passerine target species is outlined in **Table 7-25** below.

Table 7-25: Potential collision risk to non-passerine target species

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Buzzard (Low)	Twenty-seven Buzzard fatalities have been recorded within the European Context, with 27 recorded in a review of 46 wind farms up to 2004 (Hoetker et al., 2006). However, this number is low in relation to the estimated European population of up to one million pairs (Gensbol, 2008) and best available knowledge suggests mortality due to wind farms is not sufficient to cause significant population declines of this green-listed species. Predicted number of collisions is 0.03 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Common gull (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were 14 fatalities across 46 European wind farms (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting common gulls exhibit high levels of micro-avoidance at wind farms. Predicted number of collisions is 0.01 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). . The proposed impact of collision risk will be a **long-term Imperceptible Effect** (Criteria: EPA, 2022).
Common Sandpiper (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were no recorded fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting common sandpiper exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Cormorant (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were two fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting cormorant exhibit high levels of micro-avoidance at wind farms. Predicted number of collisions is 0.02 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Golden Plover (Very High)	Golden Plover have been recorded in low numbers as collision fatalities at wind farms (Hoetker et al., 2006; Grunkorn 2011). The published avoidance rate by SNH for collision risk modelling for this species is 98% (SNH 2010), indicating a high micro-avoidance rate regarding collision with turbines. In further support of a high micro-avoidance rate, a study in the Netherlands of three operational wind farms where golden plovers were both diurnally and nocturnally active found no fatalities (Krijgsveld et al., 2009). Golden plovers were not recorded breeding within the 500m turbine envelope during the survey period which reduces magnitude. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero. It must be further noted that the winter population of golden plover would be significantly larger than the summer breeding population due to the arrival of migrants from Scandinavia and Iceland.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Great Black-backed gull (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting great black-backed gulls exhibit high levels of micro-avoidance at wind farms. Predicted number of collisions is 0.02 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Great Northern Diver (Very High)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting great northern divers exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Greenshank (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero fatalities across 46 European wind farms (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting greenshank exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Grey heron (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were three fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting grey heron exhibit high levels of micro-avoidance at wind farms. Predicted number of collisions is 0.2 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Greylag goose (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there was one fatality across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 99.8% (SNH 2010), suggesting greylag goose exhibit high levels of micro-avoidance at wind farms. Predicted number of collisions is <0.01 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Hen harrier (Very High)	No hen harriers were observed breeding on site, so potential collision risk is significantly reduced due to the absence of the territorial display known as 'sky-dancing', which often occurs at heights within the predicted rotor envelope. Documented as occasionally soaring or arriving at winter roosts 'at height' (Watson, 1977), however no documented roosts were recorded within 10km of the site. Literature suggests flying at low heights is a 'ubiquitous trait' supported by a number of studies (Whitfield and Madders, 2006). The species has a high, published avoidance rate (99%) (SNH, 2017) in relation to wind turbines. Predicted number of collisions is 0.08 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Herring gull (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were 189 fatalities across 46 European wind farms (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting herring gulls exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Kestrel (High)	Twenty-nine fatalities were recorded across 46 wind farms in a published review of the effects of turbine collision on birds in the European Context (Hoetker et al., 2006). The published avoidance rate is 95% (SNH, 2010). Predicted number of collisions is 0.03 per year	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Lesser black-backed gull (Medium)	A published review of 46 European wind farms (Hoetker et al., 2006) found 45 fatalities across wind farms. However, the published avoidance rate (SNH, 2010) is 98%, suggesting birds exhibit a high level of micro-avoidance. Predicted number of collisions is 0.1 per year	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Linnet (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were four fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term**

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
		Imperceptible Effect (Criteria: EPA, 2022).
Little grebe (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were four fatalities across 46 European wind farms (Hoetker et al., 2006). Furthermore, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Mallard (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were 18 fatalities across 46 European wind farms between 2004 and 2006 (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted number of collisions is 0.01 per year.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Meadow pipit (High)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Merlin (Very High)	Merlin mainly take prey from a perch, on the ground or low in flight (Gensbol 2008). Wintering birds have been shown to employ low flight attacks for over 64% of total hunts (Dickson 1996). Occasionally birds fly upwards during a pursuit flight, but this only represents 10.8% of total hunts (Dickson 1996), possibly due to increased energy expenditure. Flight patterns during the breeding season are likely to be similar with documented hunting and commuting flight often 1-2m in height (McElheron 2005). This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Moorhen (Low)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Mute swan (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Peregrine (Very High)	Evidence of collision fatality is low, with only two birds recorded in published reviews of wind farm fatalities (Hoetker et al., 2006). The SNH recommended avoidance rate for collision-risk modelling is 98% (SNH, 2010), suggesting high micro-avoidance capabilities. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed is **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Red grouse (High)	This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed is **negligible** (<1% population lost), species sensitivity is **high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Red-breasted merganser (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Redwing (High)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were two recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Sand martin (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Skylark (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were eight recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Snipe (High)	A published review of 46 European wind farms (Hoetker et al., 2006) found 45 fatalities across wind farms. However, the published avoidance rate (SNH, 2010) is 98%, suggesting birds exhibit a high level of micro-avoidance. Predicted number of collisions is 0.02 per year	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Sparrowhawk (Low)	Sparrowhawks are a resident species of the wind farm study area, although no breeding has been recorded within the site. Published fatality rates are low, with two fatalities from a review of 46 wind farms across Europe (Hoetker et al., 2006). This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **low**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Starling (Medium)	A published review of 46 European wind farms (Hoetker et al., 2006) found 28 fatalities across wind farms. However, the published avoidance rate (SNH, 2010) is 98%, suggesting birds exhibit a high level of micro-avoidance. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Swallow (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Wheatear (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were zero recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
White-fronted goose (Very High)	Recorded once on the 28th October 2019, when a lone white-fronted goose or small family group gave three single calls over an approximate sixty second period, flying low over forestry behind the observer at VP1. No birds were noted using the site and the species does not breed in Ireland. Published fatality rates are low, with one fatality of a bean/white-fronted goose from a review of 46 wind farms across Europe (Hoetker et al., 2006). This species was not recorded within the 500m turbine buffers at rotor swept heights,	Magnitude effects is assessed is **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
	so the effective collision risk for this species is zero.	
White-tailed eagle (Very High)	Noted once, at VP1 on 28th February 2021, soaring over a hill behind Lough Boffin in the >185m height band for 120 seconds. Two white-tailed eagles, mobbed by two ravens were noted on the 30th October 2020 from Transect 1 in the 100m+ flight band, flying northwest behind Tullaghboy Hill, before flying across the site. Requires mature trees near substantial waterbodies for nesting and thus does not breed on site. Published fatality rates are low, with one fatality of a bean/white-fronted goose from a review of 46 wind farms across Europe (Hoetker et al., 2006). This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed is **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Whooper Swan (Very High)	Not recorded on site, but recorded on twelve occasions during hinterland surveys, and included in the assessment as a precautionary, owing to its Very High sensitivity status. Requires substantial waterbodies often with nearby grass/crop fields for grazing, and thus does not occur on site. Published fatality rates are low, with one fatality from a review of 46 wind farms across Europe (Hoetker et al., 2006). This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed is **negligible** (<1% population lost), species sensitivity is **very high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).
Willow Warbler (Medium)	A published review of the number of bird fatalities owing to collision with wind turbines showed there were two recorded fatalities across wind farms from eight European countries (Netherlands, Belgium, Spain, Sweden, Austria, Britain, Denmark, and Germany) (Hoetker et al., 2006). However, the published avoidance rate is 98% (SNH 2010), suggesting birds exhibit high levels of micro-avoidance at wind farms. Predicted collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **medium**, overall effect significance is **low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Direct Effect Character	Significance without mitigation
Woodcock (High)	A published review of 46 European wind farms (Hoetker et al., 2006) found one fatality across wind farms. However, the published avoidance rate (SNH, 2010) is 98%, suggesting birds exhibit a high level of micro-avoidance. This species was not recorded within the 500m turbine buffers at rotor swept heights, so the effective collision risk for this species is zero.	Magnitude effects is assessed as **negligible** (<1% population lost), species sensitivity is **high**, overall effect significance is **very low** (Criteria: Percival, 2003). The proposed impact of collision risk will be a **Long-term Imperceptible Effect** (Criteria: EPA, 2022).

7.5.2.3 *Indirect Effects: Disturbance and Displacement*

There is evidence that the rotor blades of wind turbines during operation can displace or exclude some species, which effectively results in habitat loss for these birds. Habitat loss can be direct through land take of breeding or foraging habitats for key species or indirect such as effective habitat loss through avoidance or disturbance due to factors such as perceived collision risk. Birds may therefore avoid areas proximal to turbines until habituation takes place. There are examples in the literature of habituation in species such as geese and swans (see Fijn *et al*., 2012 and Madsen and Boertmann, 2008).

Available evidence suggests that breeding passerines are not adversely affected by the presence of wind turbines. For example, a German study found no effect on numbers or spatial distribution of skylarks within 1km of turbines (Langston and Pullan, 2004).

Whitfield and Madders (2006), suggest that most studies do not detect any significant displacement of raptor species by wind turbines although there are occasional notable exceptions.

Displacement of birds by the presence of turbines is not considered to be a significant effect on the species assemblage given the limited amount of habitat available onsite and the availability of habitat in the greater area.

No further excavation works shall be required along the haul routeR or the proposed grid route during the operational phase. Only occasional maintenance works will be required (these shall be minimal without the need for large scale construction). No significant operational phase effects are predicted for both elements of the wind farm.

7.5.2.4 *Indirect Effects: Barrier Effect*

One of the potential operational effects of wind farms is avoidance where the wind farm may act as a barrier to movements (Masden *et al*., 2009). The effect of birds altering their migration flyways or local flight paths to avoid any infrastructure is a form of displacement (Drewitt and Langston, 2006). The primary effect of barrier effect is increased energy expenditure when birds have to fly further to circumvent an obstacle.

Effects can be highly variable and range from slight 'checks' in-flight direction, height, or speed, through to larger diversions around objects. Studies have shown that birds on migration may show avoidance of wind farms (Masden, 2009) but the observed distances involved were trivial in regard to total migration distances, and hence energy expenditure.

In relation to nocturnal flight activity recent studies utilising radar on both offshore and coastal wind farms in Europe have recorded macro-avoidance rates in wildfowl at least as high, or higher at night than during the day, implying that diurnal avoidance rates are comparable to those in periods of lower visibility (Desholm, and Kahlert, 2005). In the same study migrating flocks at night were recorded increasing their distance from individual turbines once inside the wind farm and also travelling in the corridors between turbines (Desholm, and Kahlert, 2005).

Potential disturbance and barrier effects due to the operation of the proposed wind farm are outlined in **Table 7-26** below.

Table 7-26: Disturbance and Barrier effect on target species

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Buzzard (Low)	Disturbance: In a review of the published impacts of wind farms on buzzard populations (Hoetker et al., 2006), it was found that overall, impacts on buzzard populations post-construction, across both winter and breeding seasons was not significant and that buzzards do show habituation to the presence of wind farms (Hoetker et al., 2006). It should also be noted that just one case of habituation is documented in this study with a second case showing signs of a lack of habituation. Barrier Effect: Barrier effects on either migration or regular flights of buzzard has been shown at two out of six studies to date (2004) in a European context (Hoetker et al., 2006). The overall barrier effect was not shown to be significant.	**Disturbance:** Magnitude of effects is assessed as **Medium** (5-20% of habitat/population lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects is assessed as Imperceptible to Slight Effect due to published cases of habituation, as well as a lack of habituation to wind farms; overall significance considered an Imperceptible to **Slight Long-term Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Medium** (5-20% of habitat/population lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival 2003).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Common gull (Medium)	Disturbance: Of a literature review, carried out by Percival (2003), all studies which indicated gull species being significantly affected or being a species found to have collided, were identified at wind farms on coastal habitats. It is uncertain that disturbance may effect gull species inland. Whilst Tullaghmore is close to the coast, breeding colonies of gulls occur slightly inland along the shorelines of freshwater lakes. Furthermore, In a review of the published impacts of wind farms on bird populations (Hoetker et al., 2006), it was found that common gulls do show habituation to the presence of wind farms (Hoetker et al., 2006). It should also be noted that just one case of habituation is documented in this study with a second case showing signs of a lack of habituation. Barrier Effect: Gulls will be more at risk from collision impacts as a result of their flight behaviour, but less sensitive to disturbance and displacement effects (Humphreys et al., 2015). For gull species such as lesser black-backed, herring and great black-backed, some studies indicate evidence for attraction, whereas others for displacement, with the remainder indicating no significant response (Cook et al., 2014; Humphreys et al., 2015).	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Not Significant due to published habituation to wind farms, a lack of breeding on site (although they do breed nearby), and a lack of suitable foraging habitat on site; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Common Sandpiper (Medium)	Disturbance: Possibility of disturbance low as the species was recorded just once on site, with this record likely referring to a migrant. The species typically winters in Africa, south of the Sahel region. Common sandpiper prefer to nest near inland lakes or slow-moving water, neither of which occur on site. Barrier Effect: A single flight-line was recorded for 60 seconds in the 0-10m height band when a lone bird was flushed by the observer. This single flight-line qualifies this as an incidental or rarely occurring species. This, combined with the fact that the single flightline was below the rotor sweep zone betokens an imperceptible barrier effect in the species on site.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Not Significant due to published habituation to wind farms; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Magnitude to migrating birds in terms of energy expenditure assessed as Imperceptible; Significance of effects of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Cormorant (Medium)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on cormorant populations post-construction. Barrier Effect: Barrier effects on either migration or regular flights of cormorant has been shown for 2/6 studies to date (2004) in a European context (Hoetker et al., 2006), with the overall effect significance being non-significant.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Not Significant due to lack of foraging habitat on site, with the majority of flight activity occurring between lakes from VP2, approximately 1km to the southwest of the site; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Golden Plover (Very High)	Disturbance: Possible disturbance during winter months from feeding or roosting locations; feeding is mainly nocturnal and ample displacement habitat is available during daylight hours. Two observations of the species (both sightings refer to an unknown number of birds, heard only in flight) over study area. Literature suggests differences in densities pre- and post-construction of wind farms is not significant (Pearce-Higgins et al., 2012); displacement is not significant but may occur up to 175m (Hoetker et al., 2006). Barrier Effect: Low published avoidance rates of wind farms (Krijgsveld et al., 2009) and changes in densities within wind farms post construction (Pearce-Higgins et al., 2012), suggests wind farms do not act as significant barriers to golden plover.	**Disturbance:** Magnitude of effects is assessed as **Low** (1-5 % population/habitat lost); species sensitivity is **Very High**. Overall impact is **Medium** (Criteria: Percival 2003). Significance of effects Not Significant due to a scarcity of sightings (two records of birds flying over calling) of the species on site over two years of surveys; overall significance considered **Long-term, Not Significant Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Low** (1-5 % habitat lost), species sensitivity is **Very High**, overall effect significance is **Medium** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible as literature suggests low published avoidance rates of wind farms; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Great Black-backed gull (Low)	Disturbance: Of a literature review, carried out by Percival (2003), all studies which indicated gull species being significantly affected or being a species found to have collided, were identified at wind farms on coastal habitats. It is uncertain that disturbance may effect gull species inland. Whilst Tullaghmore is close to the coast, breeding colonies of gulls occur slightly inland along the shorelines of freshwater lakes. Furthermore, In a review of the published impacts of wind farms on buzzard populations (Hoetker et al., 2006), it was found that common gulls do show habituation to the presence of wind farms (Hoetker et al., 2006). Barrier Effect: Gulls will be more at risk from collision impacts as a result of their flight behaviour, but less sensitive to disturbance and displacement effects (Humphreys et al., 2015). For gull species such as lesser black-backed, herring and great black-backed, some studies indicate evidence	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Not Significant due to published habituation to wind farms; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	for attraction, whereas others for displacement, with the remainder indicating no significant response (Cook et al., 2014; Humphreys et al., 2015).	**Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Great Northern Diver (Very High)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on great northern diver populations post-construction. It is important to note, that great northern diver was not observed during vantage point surveys on site - it was only recorded on hinterland surveys and has been included as a precaution. Barrier Effect: Likewise, there was no information on barrier effect for great northern diver, Hoetker et al., 2006. However, a BTO study on collision, displacement, and barrier effect in offshore wind farms (Humphreys et al., 2015) found great northern diver to have a medium barrier effect score.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible due to a total lack of sightings during VP surveys; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA 2022).
Greenshank (Low)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on greenshank populations post-construction. It is important to note, that greenshank was only observed once during VP surveys, on the 30th October 2020, flying over VP4 for 60 seconds, in the 0-10m height band. This bird is considered to be a migrant. Barrier Effect: Likewise, there was no information on barrier effect in Hoetker et al., 2006. As just a single flightline was recorded, and this was below the rotor swept zone for its entirety, it is considered barrier effect would be extremely low to non-existent for greenshank on site.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Low**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible due to a total lack of sightings during VP surveys; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Grey heron (Low)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), they found that typically, birds of open habitats were avoiding turbines by several hundred metres. Grey herons were an exception to this rule and were frequently found close to or within wind farm sites, suggesting habituation. Barrier Effect: Of seven studies, three were found to show no barrier effect, with the remaining four showing a barrier effect, however these results were statistically deemed insignificant. Sightings of grey heron were infrequent (eight sightings in total) with just 136 seconds registered in the rotor sweep zone, equating to just 0.006% of all VP observation time.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible due to infrequent sightings and published evidence of habituation to wind farms; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Greylag goose (Medium)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), they found that geese disturbance occurred as far out as 500m. Although this points to notable effects, two points must be considered: firstly, just two sightings were logged during the two-year survey period and thus greylag goose was an incidental/rare occurrence on surveys. Secondly, both sightings were off-site. One sighting occurred in winter, with the other in summer. Summer greylag geese in Ireland refer to a feral breeding population. In winter we receive Icelandic migrants which are true wild birds. Greylag geese recorded on this survey are almost certainly all feral, however they have been treated as wild (with a resulting increased species sensitivity), to err on the side of caution. Barrier Effect: All studies presented in (Hoetker et al., 2006) show evidence of a barrier effect in greylag goose. Again this result is less relevant to this study, where just two flight-lines were recorded in the two-year study period, during which the majority of flight time was below the rotor sweep zone.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible due to rarity of sightings; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA 2022).
Hen harrier (Very High)	Disturbance: No breeding or roosting was noted within the subject site. Noise disturbance/visual intrusion unlikely to deter foraging as evidence suggests birds may continue to utilise wind farms post construction (Robinson et al., 2012). Barrier Effect: Although barrier effect has been documented in at least one study in the European context; recent evidence suggests that birds continue to use wind farms post construction (Whitfield and Madders, 2006) (Robinson et al., 2012) indicating wind farms may not be significant barriers.	**Disturbance:** Magnitude effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects Not Significant to Slight due to scarcity (eight in total) sightings during the two year survey period all of which occur over just two dates; overall significance considered as **Long-term Not Significant to Slight Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Magnitude to birds in terms of energy expenditure assessed as Not Significant; magnitude of daily barrier effect assessed as Not Significant; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Herring gull (Medium)	Disturbance: Of a literature review, carried out by Percival (2003), all studies which indicated gull species being significantly affected or being a species found to have collided, were identified at wind farms on coastal habitats. It is uncertain that disturbance may effect gull species inland. Whilst Tullaghmore is close to the coast, breeding colonies of gulls occur slightly inland along the shorelines of freshwater lakes. Barrier Effect: Gulls will be more at risk from collision impacts as a result of their flight behaviour, but less sensitive to disturbance and displacement effects (Humphreys et al., 2015). For gull species such as lesser black-backed, herring and great black-backed, some studies indicate evidence for attraction, whereas others for displacement, with the remainder indicating no significant response (Cook et al., 2014; Humphreys et al., 2015).	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Not Significant due to a lack of breeding on site (although they do breed nearby), and a lack of suitable foraging habitat on site, with infrequent sightings; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Kestrel (High)	Disturbance: Disturbance (in terms of minimal distance to wind farm) has been recorded in 14 studies on wind farms in Europe; however, the maximum distance recorded was 150m (Hoetker et al., 2006). This is unlikely to be significant. Habituation to wind farms has been recorded in one case, however the only other case recorded the opposite (Hoetker et al., 2006) Barrier Effect: Barrier effects have been shown to a degree in either migrating Kestrel or regular flight paths within the European context (3 of 5 studies; Hoetker et al., 2006).	**Disturbance:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effect Not Significant to Slight due to published habituation and non-habituation to wind farms; overall significance considered **Long-term Not Significant to Slight Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Magnitude in terms of energy expenditure assessed as Imperceptible; magnitude of daily barrier effect assessed as Imperceptible to Slight as literature suggests low published avoidance rates of wind farms with habituation; overall significance considered a **Slight Long-term Effect** but with habituation an **Imperceptible Long-term Effect** (Criteria: EPA 2022).
Lesser black-backed gull (Medium)	Disturbance: Of a literature review, carried out by Percival (2003), all studies which indicated gull species being significantly affected or being a species found to have collided, were identified at wind farms on coastal habitats. It is uncertain that disturbance may effect gull species inland. Whilst Tullaghmore is close to the coast, breeding colonies of gulls occur slightly inland along the shorelines of freshwater lakes. Barrier Effect: Gulls will be more at risk from collision impacts as a result of their flight behaviour, but less sensitive to disturbance and displacement effects (Humphreys et al., 2015). For gull species such as lesser black-backed, herring and great black-backed, some studies indicate evidence for attraction, whereas others for displacement, with the remainder indicating no significant response (Cook et al., 2014; Humphreys et al., 2015).	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Not Significant due to published habituation to wind farms, a lack of breeding on site (although they do breed nearby), and a lack of suitable foraging habitat on site; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Linnet (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Barrier Effect: Hoetker et al., 2006 found evidence of a barrier effect in linnet in three cases. However, no evidence of breeding was noted on site with all observations occurring during the winter 21/22 season and no observations of the species for the other four seasons of survey onsite. Therefore, the resultant barrier effect to this species is considered to be negligible.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated four cases; significance of daily barrier effect assessed as Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA 2022).
Little grebe (Low)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on little grebe populations post-construction. Of significance is that fact that ten sightings of little grebe were made over the course of the two-year study, all of which involved stationary birds recorded from VP2. Little grebe requires lakes, ponds and similar water bodies with sufficient fish and invertebrate prey - none of which occur on site. Another point to note is that little grebe is prone to nocturnal flight displays and despite popular belief the species is capable of long migratory flights which are also completed at night. Thus whilst birds were not seen flying by day, there is a high possibility that birds may have passed over at night. Barrier Effect: Likewise, there was no information on barrier effect in Hoetker et al., 2006. Again, as no birds were detected in flight over the study area it is likely barrier effects will not occur.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Low**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well a total lack of recorded flight activity; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Imperceptible Long-term Effect (Criteria: EPA 2022).
Mallard (Medium)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was evidence of habituation to wind farms in three cases. All sightings occurred approximately 1km southwest of the site, from VP2 where birds were seen spending time on or commuting between small lakes, thus disturbance on site is very unlikely. Barrier Effect: Barrier effect was noted in three cases out of five (Hoetker et al., 2006). Likewise, as all sightings occur off-site barrier effects are unlikely.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well a total lack of recorded flight activity; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Meadow pipit (High)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Hoetker et al., 2006 found evidence of habituation in three cases out of six. Barrier Effect: Hoetker et al., 2006 found evidence of a barrier effect in meadow pipit in two out of three cases.	**Disturbance:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); Species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Slight to Moderate to due to high proportion of suitable breeding habitat and evidence of breeding on site; overall significance considered Long-term **Slight to Moderate Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); Species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated two cases; significance of daily barrier effect assessed as Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA, 2022).
Merlin (Very High)	Disturbance: Possible disturbance to wintering birds due to operational maintenance etc. No breeding or roosting was noted within the site. Barrier Effect: Barrier effect has been recorded in Europe (Hoetker et al., 2006) though this may relate mainly to large scale migration, which is unlikely at the subject site. Numbers recorded on site were low throughout the duration of the study and barrier effects are highly unlikely to apply.	**Disturbance:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **Very High**. Overall impact is **Medium** (Criteria: Percival 2003). Significance of effects Slight; overall significance considered a **Slight, Long-term Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **Very High**. Overall impact is **Medium** (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Slight; overall significance considered a **Slight, Long-term Effect** (Criteria: EPA, 2022)
Moorhen (Low)	Disturbance: One case of habituation documented by (Hoetker et al., 2006). Moorhen does not breed on site nor were any flightlines recorded on site, thus disturbance is deemed to be highly unlikely. Barrier Effect: Barrier effect has been recorded in Europe (Hoetker et al., 2006) in one case. Again, as no birds were recorded on site, barrier effects are highly unlikely to apply.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Low**. Overall impact is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Barrier Effect: Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Low**. Overall impact is **Very Low** (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA, 2022)
Mute swan (Medium)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on mute swan populations post-construction. It is important to note, that mute swan was not observed flying over site - two records were noted in lakes approximately 1km southwest of the site, from VP2. Barrier Effect: Likewise, there was no information on barrier effect for mute swan, Hoetker et al., 2006. However, with the lack of flight sightings, barrier effect is highly unlikely to be an issue in this species on site.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Medium**. Overall impact is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Medium**. Overall impact is **Very Low** (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA, 2022)
Peregrine (Very High)	Disturbance: Possible disturbance to foraging birds through noise, visual intrusion. No displacement from breeding sites due to none being recorded within the proposed site boundary (SNH 2012). Peregrine was not seen on site during the two-year survey period but was recorded once during hinterlands at Glengowla East on 23rd May 2020, involving a single bird flying over conifers to the south of the site. Included as a precaution because of its Annex I status. Barrier Effect: Hoetker et al., 2006 report one case of barrier effect in peregrines.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Very High**. Overall impact is **Low** (Criteria: Percival 2003). Magnitude Not Significant due to low level of sightings within the site; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
	Lack of on-site flight activity betokens the wind farm is unlikely to act as a significant barrier to peregrine.	**Negligible** (<1 % population/habitat lost); species sensitivity is **Very High**. Overall impact is **Low** (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA, 2022)
Red grouse (High)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on Red Grouse populations post-construction. In a literature review by Coppes et al., 2020, on the impact of wind energy facilities on grouse, they found that red grouse had the highest turbine strike rate of eight grouse species, with a total of 74 deaths recorded, with 26 deaths at one site alone. Reactions to wind farms varied, with two Norwegian studies showing no difference between grouse populations in constructed wind farms versus control areas, whilst a reduction in territorial males was noted at a Swedish wind farm. A study in the Orkney islands found no negative effects, however, another Scottish study noted decreased numbers of territorial males during construction. Numbers returned to normal one year after construction, suggesting short-term avoidance. Coppes et al., 2020 recommend forgoing planning agreement for wind turbines in areas with small or locally threatened grouse populations. Barrier Effect: Barrier effects on either migration or regular flights of Red Grouse has not been shown to date (2004) in a European context (Hoetker et al., 2006), although as previously mentioned, studies seem to indicate that barrier effect does not have seem to have significant impact, at least not during the operational phase.	**Disturbance:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Slight to Moderate due to small, sensitive population, with studies showing evidence (at least in some cases) that populations react negatively to wind farms; overall significance considered **Long-term Slight to Moderate Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Magnitude to migrating birds in terms of energy expenditure assessed as Imperceptible; magnitude of daily barrier effect assessed as Imperceptible to Slight; overall significance considered an **Long-term Imperceptible to Slight Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Red-breasted merganser (Medium)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), there was no information available on red-breasted merganser populations post-construction. It is important to note that the species was recorded on just two occasions - two of which involved stationary birds. All sightings came from VP2 which overlooks small lakes approximately 1km southwest of the site, thus the species was never recorded on site, nor is there any waterbody on site to support them. All of these pointes considered, disturbance to the species is highly unlikely. Barrier Effect: Likewise, there was no information on barrier effect for red-breasted merganser, Hoetker et al., 2006. However, with the lack of flight sightings, barrier effect is highly unlikely to be an issue in this species on site.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Medium**. Overall impact is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); species sensitivity is **Medium**. Overall impact is **Very Low** (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible, Long-term Effect** (Criteria: EPA, 2022)
Redwing (High)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Redwing does not breed in Ireland and is a winter visitor which requires trees and areas of short vegetation for foraging, thus the site is largely unsuitable for this species. Barrier Effect: Hoetker et al., 2006 list two cases of a barrier effect in redwing. As previously noted the , thus the site is largely unsuitable for this species and therefore the resultant barrier effect to this species is considered to be negligible.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **High**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **High**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated two cases; significance of daily barrier effect assessed as Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Sand martin (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Sand martin need sandy or earthen banks or occasionally old stone walls or buildings near water for nesting and thus there is no scope for this species breeding on site, although it may pass through. Barrier Effect: Hoetker et al., 2006 did not find any European case of barrier effect in sand martin.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible owing to a lack of evidence for barrier effect as well as a lack of breeding birds on site; significance of daily barrier effect assessed as Imperceptible ; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Skylark (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Hoetker et al., 2006 found evidence of habituation in three cases out of six. Skylark like open habitats with short vegetation for breeding. This habitat pattern is dominant on site. Barrier Effect: Hoetker et al., 2006 found evidence of a barrier effect in meadow pipit in five out of six cases, however this result was deemed statistically not significant.	**Disturbance:** Magnitude of effects is assessed as **Medium** (5-20% of habitat/population lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Slight to Moderate due to high proportion of suitable breeding habitat and evidence of breeding on site; overall significance considered **Long-term Slight to Moderate Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Medium** (5-20% of habitat/population lost), species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated five cases; significance of daily barrier effect assessed as

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA, 2022).
Snipe (High)	Disturbance: Possible disturbance during winter months from feeding or roosting locations; feeding is mainly in heath areas and grassy verge where invertebrates are present. Literature suggests differences in densities pre- and post-construction of wind farms has a significant effect upon snipe within the area (Pearce-Higgins et al., 2012). Hoetker et al., 2006 report one case of habituation. Barrier Effect: Recorded infrequent flight activity (eight flight-lines in total) suggests low proportion of flight activity below rotor height; the wind farm is unlikely to act as a significant barrier to the species.	**Disturbance:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Slight to Moderate to due to high proportion of suitable foraging and breeding habitat; overall significance considered **Long-term Slight to Moderate Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Low** (5-20% of habitat/population lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Magnitude to migrating birds in terms of energy expenditure assessed as Imperceptible; magnitude of daily barrier effect assessed as Imperceptible as literature suggests low published avoidance rates of wind farms; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Sparrowhawk (Low)	Disturbance: In a review of the published impacts of wind farms on sparrowhawk populations (Hoetker et al., 2006), it was found that overall, effects on sparrowhawk populations post-construction, across both winter and breeding season was not significant. Sparrowhawk do show habituation to the presence of wind farms (Hoetker et al., 2006). Breeding was not proven although winter display suggests the species at least breeds in the vicinity. Barrier Effect: Sparrowhawk is considered to be less sensitive or less willing to change their original migration direction when approaching wind farms (Hoetker et al., 2006). The species also avoided wind farms less often and their local populations were less influenced by wind farms. The overall barrier effect was not shown to be significant.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1% habitat/population lost), species sensitivity is **Low**, overall effect significance is Very **Low** (Criteria: Percival 2003). Magnitude Not Significant due to published habituation to wind farms; overall significance considered **Long-term Not Significant Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1% habitat/population lost), species sensitivity is **Low**, overall effect significance is **Very Low** (Criteria: Percival 2003). Magnitude to migrating birds in terms of energy expenditure assessed as Imperceptible; magnitude of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Starling (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Barrier Effect: Hoetker et al., 2006 found evidence of a barrier effect in starling in three cases, with another three cases of no effect - results deemed statistically insignificant.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated three cases; significance of daily barrier effect assessed as Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Swallow (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Barrier Effect: Hoetker et al., 2006 found evidence of a barrier effect in swallow in four cases. However, no evidence of breeding was noted on site with all observations occurring during the summer 22 season and no observations of the species in summer 2021. Therefore, the resultant barrier effect to this species is considered to be negligible.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated four cases; significance of daily barrier effect assessed as Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA 2022).
Wheatear (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Hoetker et al., 2006 found one case of habituation and zero cases of the contrary. Barrier Effect: Hoetker et al., 2006, found evidence of a barrier effect in wheatear in just one case, with zero cases of no effect. However, this species was recorded once during VP surveys and was not encountered during breeding walkover surveys, and hence it is considered to be an occasional passage migrant on site. Therefore, the resultant barrier effect to this species is considered to be negligible.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is **Very Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Slight owing to evidence of barrier effect in stated case; significance of daily barrier effect assessed as

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
		Imperceptible to Slight; overall significance considered an **Imperceptible to Slight Long-term Effect** (Criteria: EPA, 2022).
White-fronted goose (Very High)	Disturbance: In a review of the published impacts of wind farms on birds (Hoetker et al., 2006), they found that geese disturbance occurred as far out as 500m. Although this points to notable effects, three points must be considered: firstly, just one sighting was logged during the two-year survey period and thus white-fronted goose was an incidental/rare occurrence on surveys. Secondly, the sighting was off-site, and thirdly, white-fronted goose is not a breeding species, in Ireland. Thus as a result of the rarity of this species it is not a species which is considered to be in danger of disturbance at Tullaghmore. Barrier Effect: All studies presented in (Hoetker et al., 2006) show evidence of a barrier effect in white-fronted goose. Again this result is less relevant to this study, where just a single flight-line was recorded in the two-year study period. As this was a heard-only record it was not possible to ascertain height.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible due to rarity of sightings; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
White-tailed eagle (Very High)	Disturbance: White-tailed eagle is a species with slow reproduction and a long lifespan which makes them particularly vulnerable to wind farms and are prone to negative effects as a result of wind farm-related disturbance. In a study investigating "population dynamics in white-tailed eagle at an on-shore wind farm area in coastal Norway", Dahl (2014) found that the study population close to the wind farm experienced reduced breeding success, post construction due to mortality and displacement. A study by Dahl (2012) found that the same wind farm site, pre-construction, was relatively undisturbed by human activity and as a result had a high breeding density of white-tailed eagle. Post-construction the population at this site suffered from poor breeding success, with strong indications that a marked increase in human activity both during and after construction resulted in increased disturbances which in turn led to reduced habitat quality. However, as sightings of white-tailed eagle at Tullaghmore were rare, limited to a single VP survey sighting of one bird, a single sighting of two birds during a transect survey, and two hinterland surveys, displacement due to barrier effect is deemed to be of little significance at this site. Barrier Effect: As mentioned above, Dahl (2014) has found evidence to suggest reduced breeding success in white-tailed eagles as a result of displacement. Again, as sightings of white-tailed eagle at Tullaghmore were infrequent, displacement due to barrier effect is deemed to be of little significance at this site.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects Imperceptible due to rarity of sightings; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Whooper Swan (Very High)	Disturbance: There is evidence to suggest that whooper swan is prone to operational disturbance. For example, Winkelman (1989) found that whooper swans were displaced to feeding areas 200-400m from his study wind farm site post-construction. There is no habitat for feeding whooper swan on-site at Tullaghmore, and, furthermore, whooper swan was not recorded on-site. It was only recorded on hinterland surveys and has been included as a precaution. All things considered, whooper swan is deemed to be at risk to operational disturbance at Tullaghmore. Barrier Effect: As previously mentioned above, as whooper swans were not recorded flying over the site for the duration of the two-year study period, no barrier effect for whooper swan is anticipated.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects Imperceptible due to total lack of sightings on-site; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Very High**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).
Willow Warbler (Medium)	Disturbance: Studies on the impact of wind farms during both construction (Pearce-Higgins et al., 2012) and operation (Pearce-Higgins et al., 2009) have found little evidence of significant disturbance effects on passerine species. Hoetker et al., 2006 found one case of non-habituation and zero cases of the contrary. Barrier Effect: Hoetker et al., 2006, do not describe cases of barrier effect or a lack thereof. The species was not recorded during transect surveys within the site. It was recorded during summer 2021 vantage point surveys. Willow warbler typically forage within woodland and scrub, and as there is no suitable habitat for these species on site the resultant barrier effect is considered to be negligible.	**Disturbance:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost); Species sensitivity is **Medium**, overall effect significance is **Low** (Criteria: Percival, 2003). Significance of effects Imperceptible to due to a lack of breeding on site as well as stated little evidence of significant disturbance to passerine species; overall significance considered **Long-term Imperceptible Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as **Negligible** (<1 % population/habitat lost), species sensitivity is **Medium**, overall effect significance is Very **Low** (Criteria: Percival, 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible; significance of daily barrier effect assessed as Imperceptible; overall significance considered an **Imperceptible Long-term Effect** (Criteria: EPA, 2022).

Key Receptor (Sensitivity)	Operational Indirect Effect Character	Significance without mitigation
Woodcock (High)	Disturbance: A study conducted by Dorka et al. (2014) reports a decrease in abundance from approximately 10 males/100 ha to approximately 1.2 males/100 ha after construction of a wind farm, which may have been due to barrier effect as well as noise intrusion hampering roding display. Woodcock typically breed in mature deciduous woodland or younger coniferous plantation, with the key element being sufficient ground cover of bracken, brambles, or dead leaves for cover. These characteristics are absent from the Tullaghmore site although a substantial coniferous plantation occurs some 200m to the east of the site boundary. Woodcock are known to cover large areas when roding with some individuals recorded flying 3km in the same direction (Marcstrom, 1974), and with other studies reporting males displaying over areas greater than 100ha (Hirons 1980, 1983). Thus, for a bird to fly 200m from bordering coniferous forest would not be a huge feat, and the open, often wet, habitats on site would provide ample feeding opportunities for both breeding and wintering woodcock. Barrier Effect: Home ranges are small with birds recorded flying up to 1km from nests sites to forage (Hoodless and Hirons 2007). No published evidence of barrier effect to migrating birds (Hoetker et al., 2006). In contrast, Dorka et al. (2014) suggests that woodcock may be influenced by a barrier effect. Furthermore, Gittings (2019) reports potential displacement at an Irish wind farm site, within the 0-250m distance band. Woodcock migrate at night but studies to date have only tracked birds with Argos tags, which do not measure flight height, so we do not know what height birds are migrating at, at night.	**Disturbance:** Magnitude of effects is assessed as **Low** (5-20% of habitat lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects Imperceptible to Moderate due to a potentially small, sensitive population, with studies showing evidence (at least in some cases) that populations react negatively to wind farms; overall significance considered **Long-term Imperceptible to Moderate Effect** (Criteria: EPA, 2022). **Barrier Effect:** Magnitude of effects is assessed as Magnitude of effects is assessed as **Low** (5-20% of habitat lost within the site but 1-5% in the greater areas as these habitats are continuous outside the site boundary); species sensitivity is **High**, overall effect significance is **Low** (Criteria: Percival 2003). Significance of effects to migrating birds in terms of energy expenditure assessed as Imperceptible to Moderate; magnitude of daily barrier effect assessed as Imperceptible to Moderate as woodcock is a nocturnal migrant which travels at, currently unknown heights; also of significance is the possibility of nocturnal migrants being attracted to flashing lights, although this has yet to be tested; overall significance considered an **Imperceptible to Moderate Long-term Effect** (Criteria: EPA, 2022).

7.5.3 Potential Decommissioning Effects

The decommissioning phase of the proposed wind farm site poses similar risks to potential effects vis-á-vis the construction phase. However, it should be noted that the magnitude of the effect of decommissioning is normally reduced as all infrastructure is already in situ. No works will be required along the haul route as the turbine components will be broken up on site and therefore require less clearance to remove along the same haul road. Grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.

7.5.3.1 *Direct & Indirect Effects*

The following matrix outlines the assessment of direct effects on key avifauna receptors during decommissioning, based on the criteria previously outlined.

Note: the criteria utilised in the current assessment to define duration were as follows, from published guidance (EPA, 2022):

- Momentary: seconds to minutes;
- Brief: less than a day;
- Temporary: up to 1 year;
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

It is likely that the time period for decommissioning of the project would be ca. 6 months.

Passerines and Pigeons/Doves

Decommissioning during the breeding season may result in some minimal disturbance to breeding passerine species due to increased human activity and noise. Tree trimming shall not however be carried out during the bird breeding season. There will be no further habitat loss during the decommissioning phase and the resultant impact to passerine species is a *Temporary Imperceptible Reversible Effect.*

Birds of Prey

Although no raptors were noted breeding or roosting on site, surveys conducted as part of the proposed development indicate that buzzard, kestrel, and sparrowhawk are probably breeding within the vicinity of the study area. Merlin and hen harrier were also noted, to a lesser extent, and although breeding was not proven, these too could be breeding in the immediate vicinity, but not on site. There are very few trees on site, although a conifer plantation borders to eastern boundary. Nonetheless, tree trimming will not be carried out during the bird breeding season. There shall be no further habitat loss during the decommissioning phase. Decommissioning during the breeding or wintering season may result in some minimal disturbance to breeding or roosting kestrel, sparrowhawk, or buzzard (which may occur on the peripheries of the site), due to increased human activity and noise. The resultant impact to birds of prey is a *Temporary Imperceptible Reversible Effect.* As no breeding or roosting of raptors was noted on site, this prediction is worst-case scenario.

Waders and Wildfowl

Common gull, herring gull, great black-backed gull, and lesser black-backed gull, were all noted as flyovers. These species all breed along shorelines in the vicinity, however they did not land on site and as such no effect is anticipated for gulls.

Snipe were noted as being present within and immediately adjacent to the wind farm and potentially breeding, with woodcock potentially breeding in the coniferous plantation which occurs beyond the eastern boundary of the proposed wind farm site.

Golden plover were noted on several occasions over the winter seasons and involved records of birds landed on site. The increase in human activity and noise may result in a minimal temporary disturbance to these species.

Common sandpiper was noted just once on vantage point surveys outside the flight activity survey area, and almost certainly refers to a lone migrant. Greenshank was noted flying over the site on one occasion, however, it did not land. No effects are anticipated for common sandpiper and greenshank.

Of the wildfowl species noted from site surveys (brent goose, greylag goose, little grebe, mallard, moorhen, mute swan, red-breasted merganser, white-fronted goose, and whooper swan), none were seen to land on site and thus no effects are anticipated.

Again, as there will be no further habitat loss during the decommissioning phase, and tree trimming will not be carried out during the bird breeding season. The worst-case scenario resultant impact to waders and waterfowl is a *Temporary Imperceptible Reversible Effect.*

Red Grouse

Red Grouse was observed within heath habitat to the northwest corner of the proposed wind farm site. The increase in human activity and noise may result in a minimal temporary disturbance to this species.

Again, as there will be no further habitat loss during the decommissioning phase, and tree trimming will not be carried out during the bird breeding season. The resultant impact to Red Grouse would be a *Temporary Imperceptible Reversible Effect.*

Kingfisher

This species was not observed within the proposed wind farm site and there is no suitable habitat for the species on site. Underground cables along the cable route will stay in place. The resultant impact to Kingfishers would be a *Temporary Imperceptible Reversible Effect.*

7.5.4 Potential Cumulative Effects

7.5.4.1 *Cumulative Effects During Construction*

Direct effects on avifauna during construction are primarily land take related, mainly due to the loss of nesting habitats to key species. Other sources of land take as outlined above do have the potential to for cumulative effects on nesting or resident farmland or woodland species (the typical landscape characters) in addition to specialist species such as woodcock (potentially affected by forestry operations). Species such as robin may be affected cumulatively by further loss of hedgerows due to farming practices, etc. Even though in-combination land take is unlikely to result in range loss of any species which frequent the subject site, mitigation may be required to neutralise the effect of the proposed wind farm.

Disturbance or effective habitat loss indirectly is more difficult to quantify; especially as most species of birds may habituate to disturbance over time.

There are seven operational, consented, and proposed wind farms within 20km of the proposed wind farm site.

The nearest operational wind farm is Galway Wind Park Phase 1, Cloosh Valley/Seecon which is located approximately 6.8km to the north-west of the site.

Table 7-27: Consented and operational wind farms within 20km of the proposed site.

Wind Farm	Status	No. of Turbines	Approximate Distance to the Site Boundary	Direction from the Development
Knockranny	Consented	11	c. 15km	Southeast
Clochar na Lara	Operational	11	c. 19.8km	Southeast
Galway Wind Park Phase 1, Cloosh Valley/Seecon	Operational	36	c. 6.8km	Southeast
Galway Wind Park Phase 2, Ugool/Lettercraffoe	Operational	22	c. 10km	Southeast
Galway Wind Park Phase 3, Derradda, Seecon, Shannapheasteen, Uggool, Letter, Finnaun	Consented	9	8.5km	Southeast

Wind Farm	Status	No. of Turbines	Approximate Distance to the Site Boundary	Direction from the Development
Ardderroo	Consented	25	c. 13.5km	Southeast

Bird surveys are only available to view online for some of the seven wind farms.

The following target species were recorded at surveys conducted at Addarroo Wind Farm (13.5km southeast) between 2016 and 2018:

- Whooper Swan (Annex I)
- Greenland White-fronted Goose (Annex I)
- Golden Plover (Annex I, Red Listed)
- White-tailed Eagle (Annex I, Red Listed)
- Little Egret (Annex I)
- Common Gull (Amber Listed)
- Cormorant (Amber Listed)
- Common Tern (Annex I)
- Hen Harrier (Annex I)
- Merlin (Annex I)
- Red Grouse (Red Listed)
- Woodcock (Red Listed)
- Goldeneye (Red Listed)
- Common Scoter (Red Listed)
- Kestrel (Red Listed)
- Lapwing (Red Listed)
- Black-headed Gull (Amber Listed)
- Herring Gull (Amber Listed)
- Wigeon (Amber Listed)
- Tufted Duck (Amber Listed)
- Sparrowhawk (Schedule 4 of the Wildlife Act; 1976)
- Buzzard (Schedule 4 of the Wildlife Act; 1976).

At Galway Wind Park Phase 3, results were split between the four respective wind farms (between 6.8 and 10km southeast approx.) of Cloosh, Uggool, Seecon, and Lettercraffoe, during the summer 2017 breeding season. The following target species were recorded:

Cloosh

- Golden Plover (Annex I)
- Kestrel (Red Listed)
- Snipe (Red Listed)
- Curlew (Red Listed)
- Cormorant (Amber Listed)
- Teal (Amber Listed)
- Common Gull (Amber Listed)
- Lesser Black-backed Gull (Amber Listed)

Uggool

- Kestrel (Red Listed)
- Snipe (Red Listed)
- Lesser Black-backed Gull (Amber Listed)
- Mallard (Amber Listed)

Seecon

- Mallard (Amber Listed)
- Lesser Black-backed Gull (Amber Listed)
- Kestrel (Red Listed)
- Cormorant (Amber Listed)
- Common Gull (Amber Listed)
- Buzzard (Schedule 4 of the Wildlife Act; 1976)
- Sparrowhawk (Schedule 4 of the Wildlife Act; 1976)

Bird surveys were conducted at Knockranny Wind Farm (15km southeast) between winter 2009/10 and summer 2010. Merlin surveys were conducted in March and May 2013. The following target species were recorded:

- Red Grouse (Red Listed)
- Kestrel (Red Listed)
- Snipe (Red Listed)
- Golden Plover (Annex I)
- Sparrowhawk (Schedule 4 of the Wildlife Act; 1976)
- Whooper Swan (Annex I)
- Cormorant (Amber Listed)
- Mallard (Amber Listed)

- Teal (Amber Listed)

Based on the evidence available in addition to the fact that there is a significant distance to many of these wind farms, the lack of migration paths during survey, along with the results of hinterland surveys undertaken for the proposed development, any cumulative effects on birds during the construction phase would be a *Long-Term Imperceptible Cumulative Effect*.

7.5.4.2 *Cumulative Effects During Operation*

Direct effects on avifauna during operation which may be cumulatively added to by other existing pressures or proposed developments include collision related mortality, ongoing disturbance/displacement, and barrier effect. Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed development will combine with additional wind farms to produce additive, synergistic or antagonistic effects.

These effects include increased Barrier Effect (potentially obstructing migratory flightpaths), increased collision risk (through combined mortality in susceptible species) and increased disturbance to birds utilising foraging grounds whilst on migration.

Considering the distances of the seven previously listed wind farm sites in relation to the proposed Tullaghmore study area, the lack of migration paths during surveys, along with the results of hinterland surveys undertaken for the proposed development, the cumulative collision risk on any avian receptors is considered *negligible*. Furthermore, studies have found that local wintering birds will habituate to the presence of turbines and therefore avoid collision (Langston & Pullan, 2004). Cumulative collision mortality combined with other wind farm developments is predicted to be a *Long-Term Imperceptible Cumulative Effect*.

7.6 MITIGATION MEASURES FOR AVIFAUNA

Mitigation measures are described below which will avoid, reduce and where possible, offset potential negative effects arising in relation to avifauna from the construction, operation and decommissioning of the site. These mitigation measures shall be implemented in full.

7.6.1 Mitigation by Avoidance and Design

See **Chapter 6: Biodiversity.**

7.6.2 Mitigation Measures during the Construction Phase of the Project

7.6.2.1 *Introduction*

Construction of this project is expected to cause temporary (disturbance) adverse effects on local ecological receptors, as outlined in **Section 7.5** above. The mitigation measures described below will reduce these effects significantly.

7.6.2.2 *Project Ecologist/ECoW*

A Project Ecologist/Ecological Clerk of Works (ECoW) with appropriate experience and expertise (in implementing ecological mitigation measure for wind farm developments) will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will be awarded the authority to stop construction activity if there is potential for significant adverse ecological effects to occur.

7.6.2.3 *Avifauna*

Subject to other environmental concerns (e.g., run-off), the removal of vegetation and scrub as well as trimming of trees along the haul route and general wind farm area will be undertaken outside of the bird breeding season (March 1st to August 31st inclusive). This will help protect nesting birds.

This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt, A. L. and Langston, R. H., 2006).

Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection may require night-time operating hours; these works will be supervised by the project ecologist/ECoW.

Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance. This is in line with best practice recommendations for mitigation measures with regard to birds and wind farms as

recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).

Where/if removed or altered, re-instated hedgerows will be planted with locally sourced native species. This will result in habitat enhancement for local species of conservation importance such as meadow pipit. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).

A re-confirmatory survey (March/April) will be conducted of the proposed turbine locations to assess any evidence of target species activity or occupation of new territories (e.g. in the case of breeding snipe). Should any nesting locations be recorded, works at these locations will be restricted to outside the breeding season (March 1st to August 31st inclusive) or until chicks are deemed to have fledged (following monitoring).

The use of "white lights" on the turbines will not occur as these can attract night flying birds such as migrants, and insects, which in turn can attract bats. Certain turbines will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas where required by the IAA Lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.

7.6.3 Mitigation measures during operation

A post construction monitoring programme is to be implemented at Tullaghmore in order to confirm the efficacy of the mitigation measures; the results of this will be submitted annually to the competent authority and NPWS. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure (Drewitt and Langston, 2006).

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring; adapted to quantify collision, barrier, and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed:

1) Fatality Monitoring (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction)- A comprehensive fatality monitoring programme is to be undertaken following published

best practice (Shawn *et al*., 2010; Fijn *et al*., 2012 and Grunkorn, 2011); the primary components are as follows:

a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Shawn *et al*., 2010). No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring. Carcass removal trials shall be continued for the duration of fatality searches.
b. Turbine searches for fatalities are to be undertaken following best practice (Fijn *et al*., 2012 and Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g. 1 per month). To be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.
c. A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Reports will be submitted to the competent authority and NPWS following each round of surveys.

2) Flight Activity Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction) - A flight activity survey is to be undertaken during the summer and winter months to include both vantage point and hinterland surveys as Per SNH (2017) guidance:
   a. Record any barrier effect i.e. the degree of avoidance exhibited by species approaching or within the wind farm (Drewitt and Langston, 2006). Target species to be all raptors and owls, all wild goose and duck species, all swan species, and all wader species.
   b. Record changes in flight heights of key receptors post construction.

Reports will be submitted to the competent authority and NPWS following each round of surveys. This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction

to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

3) Monthly Wildfowl Census (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A monthly wildfowl census, following the methods utilised for the baseline survey, is to be repeated on a monthly basis during the winter period.

   This aims to:

   a. Assess displacement levels (if any) of wildfowl such as swans post construction
   b. Assess overall habitat usage changes within the vicinity of the Tullaghmore Wind Farm Development post construction.

This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS. Reports will be submitted to the competent authority and NPWS following each round of surveys.

4) Breeding Bird Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey (moorland breeding bird and Common Bird Census), following methods used in the baseline survey to be repeated yearly between early April to early July. This aims to:

   a. Assess any displacement effects such as those recorded on breeding birds. Overall density of breeding birds to be annually recorded.

5) Breeding Wader Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey, following methods used in the baseline survey to be repeated yearly April-May-June.

Both of the above surveys are to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

7.7 RESIDUAL EFFECTS FOR AVIFAUNA

To minimise effects on those species which the literature suggests can be negatively impacted, a re-confirmatory survey (March/April) will be conducted of the proposed turbine locations to assess any evidence of target species activity or the occupation of new territories. Should any new nests be recorded, works at these locations will be restricted to outside the breeding season (April-July) or until chicks are deemed to have fledged (following monitoring).

A comprehensive monitoring program will also be implemented following construction of the proposed wind farm; this will monitor the degree of barrier effect, if any, on existing species as a result of the development, in addition to comprehensively monitoring any bird fatalities.

It is considered that with the implementation of mitigation, the proposed wind farm development will have a *Slight-Imperceptible Reversible Residual Effect and in the local context* on birds.

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