7 ORNITHOLOGY

7.1 INTRODUCTION

This chapter of the EIAR describes the ornithology (avian ecology) of the proposed Drumnahough development. The proposed development is the proposed Drumnahough Wind Farm and associated ancillary aspects of the project as outlined in Chapter 2 as follows:

- Core Wind Farm Components
- Grid connection to the permitted Lenalea substation
- Alternative grid connection option
- Other Associated Development Components

Hereafter, these are collectively referred to as the 'proposed development'. Non avian ecology is addressed in EIAR **Chapter 6, Biodiversity,** of this EIAR. The aim of the current study is to assess whether the proposed development will result in likely significant impacts for avian species. Where potential impacts are identified, mitigation measures have been developed to avoid or reduce residual significant effects.

This assessment is based on published literature and ornithological surveys completed at the study area over two consecutive years, between April 2018 and March 2020. The following reports are included as appendices to this chapter (see Volume 3 of the EIAR) are as follows:

- Appendix D-8: 2018 Breeding Bird Survey Report
- Appendix D-9: 2018/19 Winter Bird Survey Report
- Appendix D-10: 2019 Breeding Bird Survey Report
- Appendix D-11: 2019/20 Winter Bird Survey Report

These supporting appendices include all the data from the ornithological surveys completed within the study area. The field study area was defined as the proposed development site and surrounds, extending away from the proposed development site as necessary to account for birds potentially affected. The desk study area was extended to county level for particular birds to capture distribution and breeding records. **EIAR Volume 3 Appendix D-12** contains the Collision Risk Assessment (CRA) document which provides the results of the Collision Risk Modelling (CRM) undertaken for the proposed development. Appendices referenced in this chapter are included in Volume 3 of the EIAR.

As part of the proposed development, some tree felling is required; it is proposed to replant at lands in four off-site areas; two in Co. Clare, one in Co. Galway and one in Co. Cork/Limerick. This planting will provide balance for forestry felled to accommodate the wind farm at the proposed development site. A separate report has been prepared to assess the likely significant effects on the avifauna in these areas (See **EIAR Volume 3 Appendix D-3**). The turbine delivery route (TDR) for the proposed development is largely along the existing road network between Killybegs and the proposed wind farm site, with a small proportion through existing adjacent wind farms. The TDR requires small adjustments on some bends where turns are too sharp to accommodate the turbine delivery (TD)

vehicles. The replant components of the proposed development are assessed using the same criteria used in the main body of this report.

Areas designated for nature conservation within the European context have been considered in a standalone Natura Impact Statement (NIS) report prepared to deal specifically with European sites.

This ecological assessment was carried out with regard to the following publications:

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017)
- Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019)
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)
- Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage (SNH, 2017)
- Assessing Connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage SNH (2016a)
- Wind energy development and Natura 2000. Guidance document (European Commission, 2011)
- European Commission Guidance on the preparation of the Environmental Impact Assessment Report (EC, 2017)
- Best Practice Guidelines for The Irish Wind Energy Industry (Irish Wind Energy Association, 2012)
- Assessing the Cumulative Impact of Onshore Wind Energy Developments. Scottish Natural Heritage (SNH, 2012)
- Assessing Significance of Impacts from Onshore Windfarms on Birds Out with Designated Areas (SNH, 2018)

Article 3(1) of the EIA Directive requires the EIA to identify, describe and assess the direct and indirect significant effects of a project on biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC. This chapter meets these criteria through identification, description and assessment of direct and indirect significant effects of the proposed development on avifauna, as required under these directives. In this chapter, attention to species and habitats protected under these directives have been subject to the same level of scrutiny, noting that the European sites have been assessed in detail through NIS.

7.1.1 Scope of Assessment

This chapter assesses the potential impacts on birds and their habitats with particular reference to species of ornithological importance. These include bird species with National and International protection under the Wildlife Act 1979 as amended, and the EU Birds Directive 2009/147/EC. Features of ornithological significance occurring or likely to occur within the zone of influence (ZOI) of the development were classified as avian Key Ecological Receptors (KERs). A KER is defined as a site, a habitat, ecological feature, assemblage, and species or individuals that occur within the vicinity of a proposed development upon which effects are likely. A habitat is the environment in which an animal or plant lives, generally defined in terms of vegetation and physical structures.

The avian ecology of the area within and surrounding the proposed development was first assessed in terms of habitats available and species present. The area over which the proposed development has the potential to result in effects, i.e. its ZOI is then determined. The ZOI has been determined by careful scientific analysis of the receiving environment within which the development is located. The ZOI includes the full extent of the proposed development site, land extending away from the site, any potential commuting routes, designated sites in the area which support ecological connectivity/species connectivity with the proposed development. The habitats occurring and avian activity over/extending away from the site, and SPAs were all considered in the establishment of the ZOI. In this regard, the ZOI includes the entire footprint of the proposed development, including the proposed development site, the 2 No. grid connection routes being considered, the transport delivery route, designated sites (including SPAs), and avian activity at or near the proposed development site.

The assessment of the importance of the proposed development site for birds began with a desk study of available published data on sites designated for nature conservation, other ecologically sensitive sites, habitats and species of interest in the vicinity of the proposed development. A review of OSI mapping, online environmental web-mappers and ortho-photography was also undertaken. The baseline information obtained from the desk study was the first stage in defining a ZOI of the proposed development.

Following the desk studies, a review was carried out of the comprehensive ornithological surveys completed at the proposed core wind farm development site. The surveys completed recorded the avian species, and the suitability of the habitats present as well as those extending away from the proposed core wind farm development site.

This chapter quantifies any potential impacts relating to the KERs and identifies any measures required to avoid, reduce and mitigate likely significant effects. Identification of effects and prescribed mitigation has been derived following a collaborative approach working with a multi-disciplinary team including site ornithologists, ecologists, and project engineers. The results of the ornithological surveys have been utilised to inform the design of the proposed development, thereby minimising potential effects on avian ecology, sensitive habitats, and species of conservation interest.

The information provided in this EIAR chapter, accurately and comprehensively describes the baseline ornithological environment; provides an accurate prediction of the potential impacts on the KERs from the proposed development; prescribes mitigation where necessary; and, describes the residual effects on avian ecology.

7.1.2 Legislation and Policy Context

The most important legislation underpinning biodiversity and nature conservation in Ireland are the:

- Wildlife Acts 1976 to 2012;
- European Communities (Birds and Natural Habitats) Regulations 2011-2015 (transposes EU Birds Directive2009/147/E C and EU Habitats Directive 2009/147/EC, 92/43/EC); and
- The International Convention on Wetlands of International Importance 1971.

The Wildlife Act, 1976, is the principal national legislation providing for the protection of wildlife and the control of some activities that may adversely affect wildlife. The aims of the Wildlife Act, 1976, are to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims.

The EU Directive on the Conservation of Habitats, Flora and Fauna (92/43/EEC), commonly known as "the Habitats Directive", was adopted in 1992, came into force in 1994 and was transposed into Irish law in 1997. In addition, certain other obligations of the Habitat Directive have been transposed by the European Communities (Birds and Natural Habitats) Regulations 2011, and Part XAB of the Planning and Development Act 2000, as amended.

The Convention on Wetlands of International Importance especially as waterfowl habitat, more commonly known as the Ramsar Convention, was ratified by Ireland in 1984 and came into force for Ireland on 15 March 1985. Ireland presently has 45 sites designated as Wetlands of International Importance, with a surface area of 66,994 hectares.

7.1.3 Consultation

The following statutory and non-statutory authorities/bodies/departments/agencies were consulted in 2019 in relation to the proposed development:

- Birdwatch Ireland
- National Parks and Wildlife Service
- Donegal County Council (DCC) Conservation Officer
- DCC Environmental Department
- DCC Heritage Department
- Department of Culture Heritage and the Gaeltacht
- Irish Wildlife Trust
- Irish Raptor Study Group

7.1.3.1 Pre-planning Meeting with NPWS

A pre planning application meeting was held with the National Parks and Wildlife Service (NPWS) on the 19th February 2020 in Ballybofey, Co. Donegal. The discussion included reference to merlin (*Falco columbarius*), red grouse (*Lagopus lagopus hibernicus*), golden eagle (*Aquila chrysaetos*), hen harrier (*Circus cyaneus*) and how species use the wider landscape. There was also a discussion on the use of native planting along the site roads to improve diversity of plant species on the site. Following on from the meeting, Malachy Walsh and Partners (MWP) sought and obtained data on various birds (red-throated diver *Gavia stellata*, merlin, golden plover *Pluvialis apricaria*, peregrine falcon *Falco peregrinus*, dunlin *Calidris alpina schinzii* and curlew *Numenius arquata*) in Co. Donegal. These records are presented **Section 7.1.4.**

7.1.3.2 Pre-planning Meeting with An Bord Pleanala

Pre-planning application meetings were held with An Bord Pleanála (ABP) in October 2019 and January 2020. Discussions included biodiversity at the site, and the use of the site and surrounds by merlin, red grouse and hen harrier, particularly for foraging. ABP indicated the desirability to tie-in

ongoing survey work with previous survey work to produce as comprehensive a picture as possible regarding the subject site. To this end, the findings of the earlier surveys have been included in this report.

7.1.4 Methodology

7.1.4.1 Desktop Study

A desktop review of the information available for the study area was undertaken. The study area includes lands directly affected by the proposed development (areas on which the components of proposed development occur), as well as habitats that may be geographically distant from the proposed development but whose ecological interests may be indirectly affected by the construction and operation of the proposed development.

Relevant published books, reports and scientific literature were reviewed. A full list of the literature sources utilised in the desk study is provided in the references section of this report.

The following publications, resources and datasets were accessed/consulted:

- Ordnance Survey Ireland (OSI) aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS)
- National Biodiversity Data Centre online resources
- BirdWatch Ireland - online resources
- BirdLife International – online resources
- Irish Wetland Bird Survey I-WeBS
- Bird Atlases: (Sharrock, 1976; Lack, 1986; Gibbons *et al.,* 1993; Balmer *et al*., 2013).
- Birds of Conservation Concern (BoCCI) in Ireland 2014-2019 (Colhoun & Cummins, 2013)
- Environmental Impact Statements from relevant developments in the region, including windfarms
- Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland. Guidance Document (McGuinness *et al.*, 2015).
- Other information sources and reports footnoted in the course of the report

The proposed development lies within Ordnance Survey National Grid 10km square C00. Data requests were submitted to and received from NPWS for records of rare and protected flora/fauna within the 10km grid squares C00 and other 10km grid squares surrounding the site.

An Environmental Impact Statement for an earlier application for a proposed wind farm at the site (Fehily Timoney Company, 2008) was reviewed. Ecological information was sourced from reports for other wind energy developments in the region, including wind farms at Lenalea, Culliagh and Meenbog. All of these are within 3km of the proposed development site and the operating Lenalea and Cark Extension wind farms are located directly to the east. Data collected on the birds present in the wider area were considered to give a broader perspective of the local upland bird community. Historical environmental data at the county level (where available) was collated and analysed, and relationships with land use, including wind energy development were deduced. This exercise was carried out to broadly ascertain how the receiving environment has absorbed changing land use in recent decades.

7.1.4.2 Countryside Bird Survey (CBS) records and Sensitivity Mapping

The Countryside Bird Survey (CBS) is coordinated by BirdWatch Ireland and funded by the National Parks and Wildlife Service. During the breeding season, CBS counters record all birds seen and heard during two early morning walks in pre-assigned 1km grid squares. Two visits are made to the site – one in early summer (April to mid-May) and the second about 4 weeks later (mid-May to end June). This survey is not site-based; it is focussed on monitoring the status of common and widespread breeding bird populations. The squares selected for survey have been based on a random and stratified design. Birdwatch Ireland have developed a Bird Wind Sensitivity Mapping Tool for Terrestrial Wind Energy Development. Results from 1km grid squares overlapping the proposed development (C0604, C0704, C0603 and C0703) were downloaded and reviewed.[1]

7.1.4.3 Identification of Target Species and Avian Ecological Receptors

The results of the desktop study and reconnaissance surveys were used to identify those bird species which were considered likely to occur at the site and in the surrounding area. Of these, target species were identified which formed the main focus of the bird surveys.

Target species are typically those species which are afforded a higher level of legislative protection or which are considered to be more sensitive to potential impacts from wind farm developments by virtue of their behaviour (SNH, 2017). Target species should be restricted to those likely to be affected by wind farms (SNH, 2017). With regards to drawing up the target species list for Drumnahough, the SNH (2017) guidance was referred to. This guidance outlines three important sources of potential target species. Additionally, species of conservation interest (SCI) for SPAs located within a 20km radius of the site were considered to take account of birds that fly longer distances between roosting and foraging locations (greylag geese). The target species list was drawn from:

- Annex I of the Birds Directive
- Special Conservation Interests (SCI) of Special Protection Areas (SPA) within a 20km radius of the proposed development site
- Species protected under the fourth schedule of the Wildlife Acts 1976-2012 (buzzards, eagles, falcons, harriers, hawks, kites, osprey, owls)
- Red-listed birds of Conservation Concern (Colhoun and Cummins, 2013)
- Bird species that are susceptible to impacts from this type of development.

Therefore, only red-listed species have been included as target species, unless the species meets one of the other target species selection criteria e.g. Annex I, outlined above. However, to ensure other species which may be sensitive to wind farms were not missed during surveys all other species of gull, wader, duck, goose, swan, cormorant and heron were included as secondary target species. According to SNH (2017), it is generally considered that passerine species are not significantly impacted by windfarms. While they were not, therefore, included as either (primary) target or secondary target species their presence was recorded in order to provide a complete picture of bird usage of the site. Wind-farm sensitive species meeting the criteria outlined above which were not identified as previously occurring within the general area during the desk-top study such as golden

[1] https://c0cre470.caspio.com/dp.asp?AppKey=4bae30003837d13624fb4a4087d1

eagle was also included as target species, where recorded. Target species lists from surveys completed can be viewed in **EIAR Volume 3 Appendix D-8** to **D-11** and were as follows: hen harrier; sparrowhawk (*Accipiter nisus*); common buzzard (*Buteo buteo*); kestrel (*Falco tinnunculus*); merlin; red grouse; common snipe (*Gallinago gallinago*); woodcock (*Scolopax rusticola*); rock dove (*Columba livia);* northern lapwing (*Vanellus vanellus*); curlew and twite (*Carduelis flavirostris)*.

7.1.5 Field Surveys

Bird surveys were conducted at the Drumnahough wind farm site on a monthly basis over six-month periods during the following breeding (April through to September inclusive) and winter (October to March inclusive) seasons:

- breeding season of 2018
- winter season 2018/19
- breeding season of 2019
- winter season 2019/20

Vantage point (VP) surveys comprised the main survey method. Hinterland, transect, walkover and point counts surveys were also used to collate data during the breeding survey and the winter surveys. The survey methods are detailed in the accompanying **EIAR Volume 3 Appendix D-8** to **Appendix D11** and are summarised below. A bird survey is currently being undertaken for the 2020 breeding season.

Monthly vantage point (VP) surveys were carried out at five VP locations in accordance with methodology set out in SNH (2017) guidance, '*Recommended bird survey methods to inform impact assessment of onshore wind farms*'. VP locations and associated viewsheds are illustrated in **Figure 7-1.** VP1 to VP4 were selected for coverage of the proposed development site. VP5 was included as it covers Lough Deele, a habitat sometimes found to be used by birds of high conservation importance, including red-throated diver and whooper swan, and for which valuable information could be collected for this assessment. Lough Deele is the only significant body of standing water near the proposed development site, the next nearest being Lough Muck, in excess of 7km to the west. VP2 was an important location with respect to merlin nesting activity. VP2 was located inside the proposed development site boundary and the implications for bird disturbance due to human presence have been considered. It is noted however that the viewshed of VP3 included the area influenced by surveyor presence at VP2, and that simultaneous surveys were not undertaken at these locations.

VP surveys involve observations of birds from a stationary position using binoculars or telescope. The overall aim of these surveys was to quantify the level of flight activity and, its distribution over the survey areas. During VP surveys the flight behaviour of target and secondary target species was recorded. Behaviour of secondary species was also recorded; however, recording of secondary species was subsidiary to recording of target species (SNH, 2017). Details on vantage point watch surveys are presented in **EIAR Volume 3 Appendix D-8** to **Appendix D-11**. This includes full details of dates, times, survey locations, survey duration and weather conditions for each survey.

Hinterland surveys were undertaken within 5km radius of the site boundary to determine the suitability of the surrounding habitats for target species with particular focus on birds of prey and

whether large assemblages of birds (e.g. wildfowl, waders) occurred regularly in the locality. Transect, point count and walkover surveys were also undertaken.

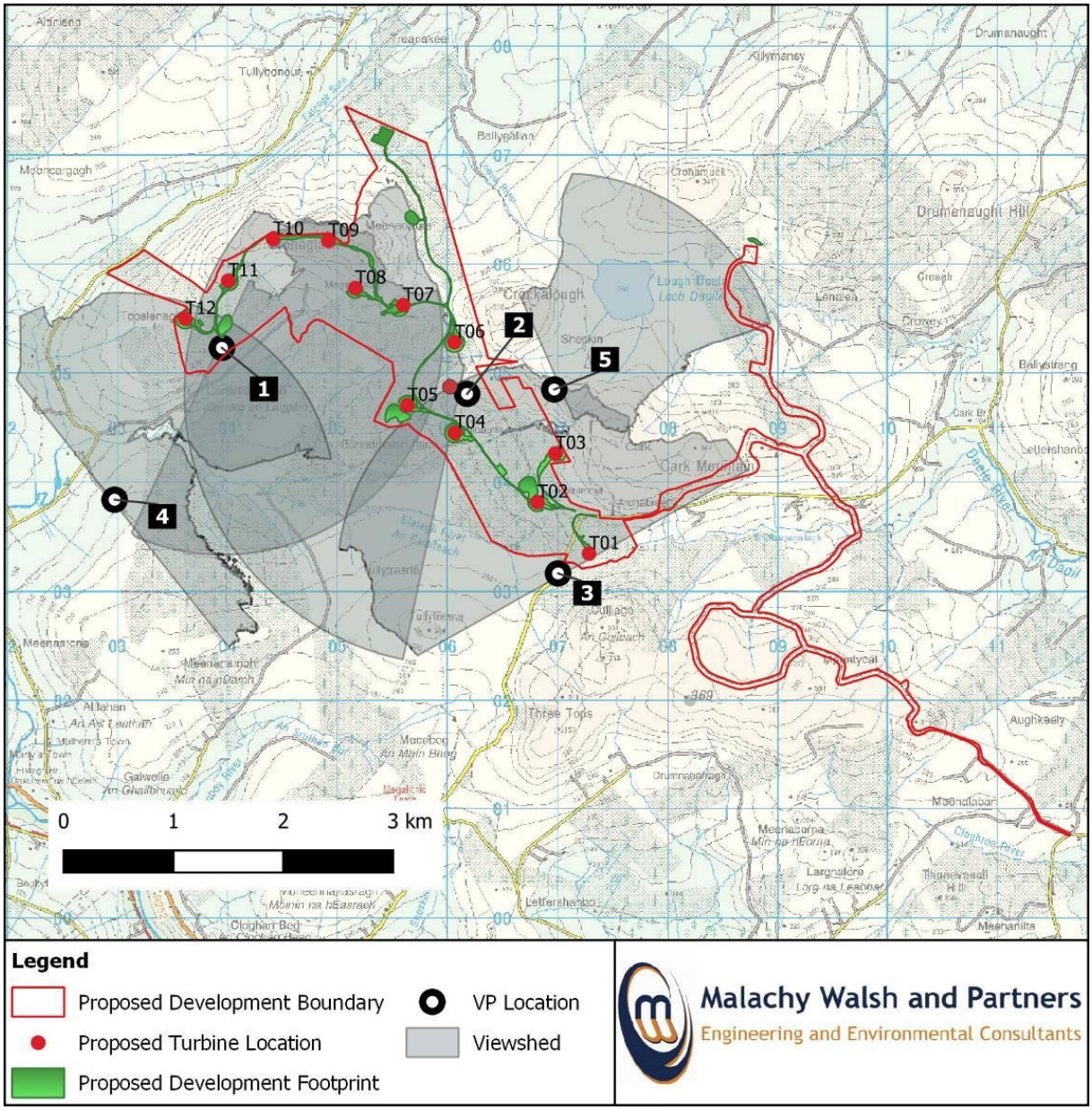

Figure 7- 1 Vantage point locations and viewsheds

7.1.5.1 Merlin Survey

During the breeding season in 2018, a suspected merlin nest appeared to be in the area close to VP2. Adults and fledglings were observed interacting during the 2018 breeding survey period. Since then, adult merlin activity has been recorded in winter 2018/19 and breeding 2019 with all observations occurring exclusively at VP2. A nest watch survey was carried out to determine whether the nest was occupied or if it has been successful. The watch was carried out from a suitable vantage point; in this case VP2 was used. Two nest watches were carried out during the 2019 breeding season, one in June and the other in July. Details on each watch survey including survey date, time and weather conditions can be found in **EIAR Volume 3 Appendix D-10**.

7.1.6 Impact Assessment Methodology and Ornithological Evaluation Criteria

This section concerns itself with the criteria upon which ecological assessments/evaluations and impact assessments are made, referring to relevant legislation and guidelines where available.

7.1.6.1 Collision Risk Modelling

Flight data recorded from four vantage point (VP) locations from April 2018 to March 2020 (inclusive) was used in conjunction with a mathematical model used to estimate strikes of various bird species with proposed turbine rotors. This requires determination of the number of birds or flights passing through the air space swept by the rotor blades of the wind turbines (stage 1) and calculation of the probability of a bird strike occurring (stage 2). The calculations of Stages 1 and 2 are reliant on various turbine and bird parameters including "the size of the bird (both length and wingspan), the breadth and pitch of the turbine blades, the rotation speed of the turbine and the flight speed of the bird" (Band *et al*., 2007). A potential collision height (PCH) of between 20m and 180m above ground was established based on the proposed turbines having a maximum blade tip height of 167.5m, and a rotor diameter of 145m. The product of Stage 1 and Stage 2 gives a theoretical annual collision mortality rate on the assumption that birds make no attempt to avoid colliding with turbines. The model was then adjusted for avoidance behaviour.

7.1.6.2 Evaluation

Guidance on Ecological Impact Assessment (CIEEM, 2019) recommends categories of nature conservation value that relate to a geographical framework (International, through to Local). The evaluation set out in this chapter and the assessment of the effects of the proposed development follows methodologies set out in 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (NRA, 2009) (see **EIAR Volume 3 Appendix D-4**). The guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned based on the importance of any particular species/receptor. The guidelines provide a basis for determination of whether any particular site is of importance on the following scales:

- International
- National
- County
- Local Importance (higher value) and
- Local Importance (lower value)

The NRA Ecological Impact Guidelines (2009) clearly sets out the criteria by which each geographic level of importance can be assigned. Locally Important (lower value) receptors contain habitats and species that are widespread and of low ecological significant and of any importance only in the local area. Internationally Important sites are either designated for conservation as part of the Natura 2000 Network (SAC or SPA) or provide the best examples of habitats or internationally important populations of protected flora and fauna. All species were assigned a level of significance on the above basis and the ZOI and avian KERs were established and classified on this basis.

This evaluation scheme seeks to provide value ratings for ecological receptors, with values ranging from internationally to locally important. Internationally important receptors include candidate Special Areas of Conservation (cSAC) or Special Protected Areas (SPA) while those of national

importance include Natural Heritage Areas (NHA). The value of avifauna is assessed on its biodiversity value, legal status and conservation status. Key ecological receptors (KER's) are referred to by NRA (2009) as those ecological features which are evaluated as Locally Important (higher value) or higher and are likely to be impacted significantly by the proposed development. Features that were evaluated as being of Local Importance (higher value) and higher in this study were selected as avian KERs and then the impact significance on each of these features was assessed.

7.1.6.3 Determining the sensitivity of bird species and magnitude of effects

Evaluating the sensitivity of birds follows the guidance set out in Percival (2003). Percival's methodology is considered alongside the other literature relating to the effects of windfarms on birds as reviewed in Whitfield and Madders (2006) and Drewitt and Langston (2006). This methodology has been used to assess the sensitivity of a species to the development type, the magnitude of the effect, and the significance of the potential impact. A number of factors are used to determine this sensitivity:

- Whether the species is on Annex I of the EC Birds Directive;
- Whether the species is particularly ecologically sensitive – this includes large birds of prey and rare breeding birds (including divers, common scoter, hen harrier, golden eagle, red-necked phalarope, roseate tern and chough)
- Whether the site contains species at nationally important numbers (>1% of Irish population);
- Whether the site contains species at regionally important numbers (>1% of regional population, with the region usually taken as the county) and
- Whether the species is subject to special conservation measures, such as red or amber species on the BirdWatch Ireland's (Colhoun and Cummins, 2013) list of Birds of Conservation Concern (BoCCI)

The sensitivities are evaluated using the criteria set out in **Table 7- 1** and **Table 7- 2.** It is noted that Percival (2007) has a later bird sensitivity rating system but has attributes that apply to the UK only, so Percival (2003) determinations have been used.

Table 7- 1 Definition of terms relating to the nature conservation value of important species (adapted from Percival, 2003)

Sensitivity	Determining Factor
Very High	Species that form the cited interest of SPAs and other statutorily protected nature conservation areas. Cited means mentioned in the citation text for the site as a species for which the site is designated.
High	Species that contribute to the integrity of an SPA but which are not cited as species for which the site is designated. Ecologically sensitive species including the following: divers, common scoter, hen harrier, golden eagle, red necked phalarope, roseate tern and chough. Species present in nationally important numbers (>1% Irish population)
Medium	Species on Annex 1 of the EU Birds Directive. Species present in regionally important numbers (>1% regional (county) population). Other species on BirdWatch Ireland's red list of Birds of Conservation Concern
Low	Any other species of conservation interest, including species on BirdWatch Ireland's amber list of Birds of Conservation Concern not covered above.

Once the species or populations of species in the study area have been evaluated in terms of their sensitivity, the next step is to determine the magnitude of the possible effects that may occur. The significance of any one impact is a product of the sensitivity of the receptor, the magnitude of the impact and the probability of that impact occurring. The determination of the magnitude of the effects is shown in **Table 7- 2**.

Table 7- 2 Determining the magnitude of effects on a site (Percival, 2003)

Magnitude	Description
Very High	Total loss or very significant alteration of the baseline features such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site *Guide: <20% of local 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 local population/habitat lost
Medium	Loss or alteration of one or more key elements/features of the baseline conditions, such that the post-development character/composition/attributes etc. would be partially changed. Guide: 5-20% of local 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 conditions will be similar to pre-development circumstances/patterns. Guide: 1-5% of local population/habitat lost
Negligible	Very slight change from baseline situation. Change barely distinguishable, approximately to the "no change" situation. Guide:<1% of local population/habitat lost

The significance of the effects is determined based on the sensitivity of the species and the magnitude of the effects as presented in **Table 7- 3**. The methodology allows this by cross-tabulating the sensitivity of the species, and the magnitude of the effects, to give a prediction of the significance of each potential impact.

Table 7- 3 Matrix for gauging the level of effects (Percival, 2007)

Value of Receptor	Magnitude of Impact			
	Very high/High	Medium	Low	Negligible
Very high	Major	Major	Major	Minor
High	Major	Major	Minor	Minor
Medium	Major	Major	Minor	Minor
Low	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

7.1.6.4 Impact Assessment EPA Criteria (2017)

The significance of an effect is determined by way of professional judgement and the use of EPA criteria for assessing impact (EPA, 2017). The criteria for assessing quality of impacts and significance of effects are set out in **Table 7- 4.**

Table 7- 4 Criteria for assessing impacts based on CIEEM (2019) and (EPA, 2017)

Parameter	Description	
Direction (Quality)	Positive: A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).	
	Neutral: No impacts or impact that are imperceptible, within normal bounds of variation or within the margin of forecasting error.	
	Negative: 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).	
Magnitude	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 baseline 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
Extent	The area over which an impact occurs.	
Duration	• Momentary – effects lasting from seconds to minutes • Brief – effects lasting less than a day • Temporary – effects lasting less than a year • Short-term – effects lasting 1 to 7 years • Medium term – effects lasting 7 to 15 years • Long term – effects lasting 15 to 60 years • Permanent – effects lasting over 60 years	
Reversibility	Irreversible impacts: permanent changes from which recovery is not possible within a reasonable time scale or for which there is no reasonable chance of action being taken to reverse it. Reversible impact: temporary changes in which spontaneous recovery is possible or for which effective mitigation (avoidance/cancellation/reduction of effect) or compensation (offset/recompense/offer benefit) is possible.	
Frequency and timing	Frequency – How often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)	

7.1.6.5 Mitigation

The relationship between wind energy developments and birds is variable and complex and depends on a number of factors including the extent and type of development, associated topography, habitat type, the bird species present and their distribution and abundance in the area. As such, the location selected for wind energy projects and the siting of infrastructure with those project sites is important to minimise impacts to birds. Most potential impacts can be minimized or reduced by avoiding areas with sensitive habitats and key populations of vulnerable or endangered species. Ongoing research continues to increase understanding of the effects of wind energy on birds and thereby guide best practice.

Different bird species' sensitivity score to wind energy are provided by NBDC in collaboration with Birdwatch Ireland (McGuinness *et al.,* 2015). The criteria for estimating a zone of sensitivity (i.e. 'low', 'medium', 'high' and 'highest') is based on a review of the behavioural, ecological and distributional data available for each species. Bird Sensitivity to Wind Energy is based on the collation of existing distributional data and a formula for species sensitivity score (SSS). SSS = conservation score x (average of flight vulnerability scores + average of habitat vulnerability scores). A map indicating bird sensitivity to wind energy is provided below (See **Figure 7- 2**). The proposed development intersects nine 1km grid squares, where bird sensitivity to wind energy is 'Low'. The only bird listed within the proposed wind farm site is red grouse, with a sensitivity rating of 15.1. The Grid connection to the permitted Lenalea substation and the TDR pass through areas of low sensitivity for red grouse and curlew. The sensitivity rating for 1km grid square C0104 to the west of the site is 35 (15.1 + 19.9), as Eurasian curlew (19.9) have also been added here. Pearce-Higgins (2009) found that levels of turbine avoidance suggest breeding bird densities may be reduced within a 500m buffer of the turbines by 15–53%, with common buzzard, hen harrier, golden plover, snipe, curlew and northern wheatear (*Oenanthe oenanthe*) most affected.

Potential effects of proposed windfarm developments can be reduced with careful planning and siting of windfarm developments (Dirksen *et al*., 1998, Hötker *et al*., 2005, cited in Wilson *et al*. 2015). The proposed development has been designed to specifically avoid, reduce and minimise effects on all avian KERs by applying mitigation based on the concepts established by literature such as those in the Pearce-Higgins (2009) study. Consultation between the design team (Project Manager, Project Engineers, Project Ecologists, and Project Ornithologists) and the developer was conducted on an ongoing basis during the design phase, in order to formulate a project design which would avoid, by design and at source, any construction activities and minimise habitat loss for avian KERs such as merlin. Design was an iterative process until the most optimum layout for the windfarm was realised with negative impacts avoided where possible.

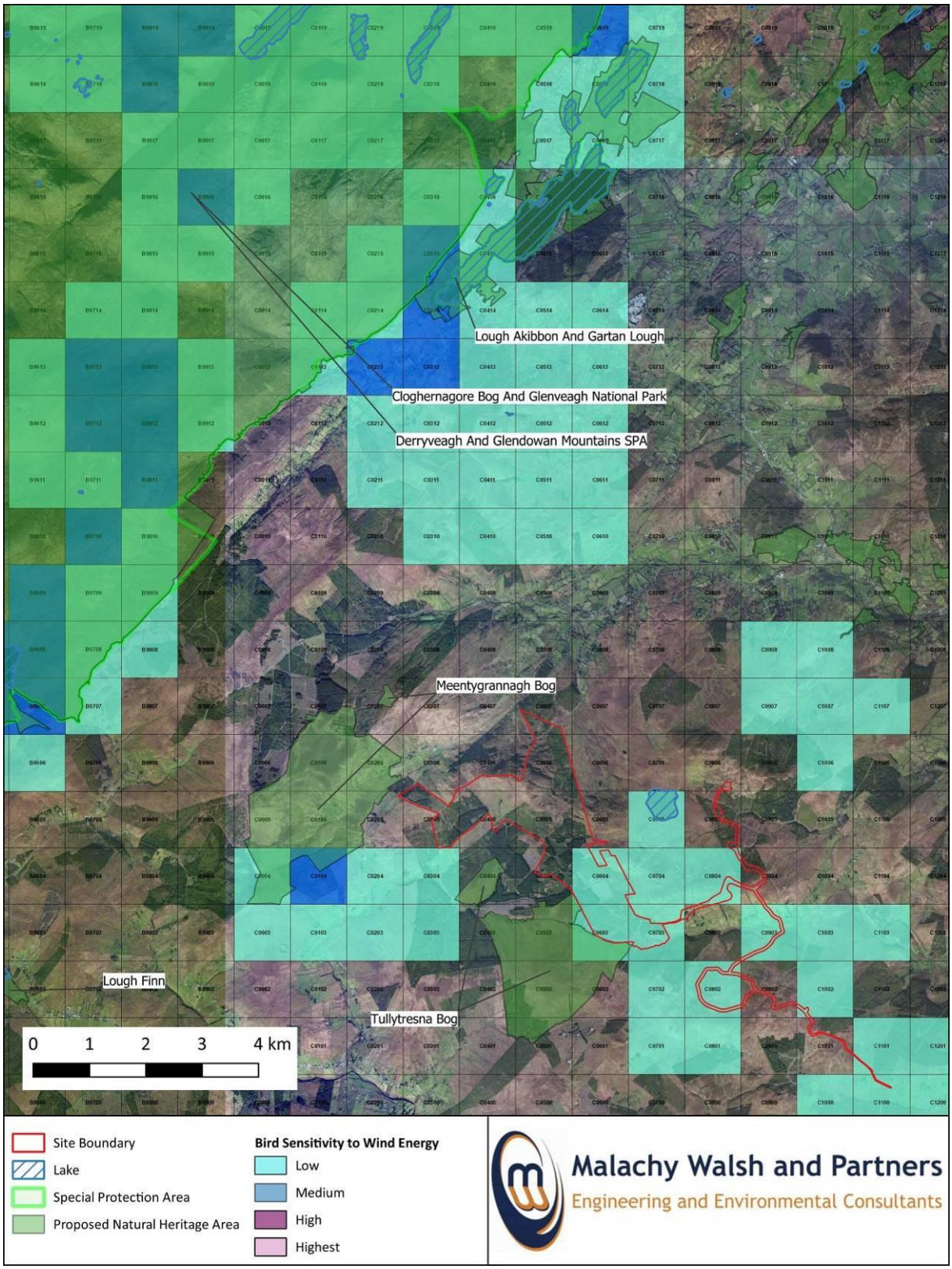

Figure 7- 2 Bird sensitivity to wind energy at and in the environs of the proposed development site

An example of this approach was the siting of the turbines, which were positioned on the least ecologically valuable areas for birds to avoid or minimise direct impacts on valuable bird habitats (corresponding to avoidance of peat habitats). Where required, mitigation has been included to avoid or reduce potential effects (see Chapter 4, Alternatives and the Project Evolution Report).

Proposed best practice design and mitigation measures are specifically set out. They have been subject to detailed design and will address the effects on avian KERs.

7.1.7 Statement on Limitations and Difficulties Encountered

As the site is situated in an upland area, the weather conditions during winter periods may on occasion be unsuitable for ornithological surveys. However, the weather was monitored, and surveys were scheduled around poor weather conditions.

The information in this chapter of the EIAR includes robust data with which the likely impacts as a result of the proposed development are assessed. No limitations were identified in terms of scale, scope or context in the preparation of this chapter of this EIAR.

7.2 RECEIVING ENVIRONMENT

7.2.1 Designated Sites

It is considered that designated sites beyond 15km are outside the ZOI of the proposed development based on guidance in SNH (2016). This guidance provides information on dispersal and foraging distances for a range of bird species which are frequently encountered when considering plans and projects. To assess whether there are processes or pathways by which the proposal may influence a site's qualifying interests, SNH (2016) notes the importance of considering distances that some species may travel beyond the boundary of their SPAs. The foraging range from nest sites during the breeding season and from night roosts during winter season are given in SNH (2016). Fifteen kilometres beyond the proposed development, the core foraging areas of all SCIs of SPAs are less than 15km. For example, Lough Fern SPA (pochard *Aythya ferina*) and Lough Nillan Bog SPA (merlin, golden plover, Greenland white-fronted goose (*Anser albifrons flavirostris*) and dunlin are located ca. 17.5km northeast and 18km southwest of the proposed development respectively, where birds in parenthesis are the SCIs of these sites. The greatest foraging range of all SCI birds within these SPAs is golden plover, with a core foraging range of 3km and maximum range of 11km from nest site during breeding season. Next is Greenland white-fronted goose, with a night roost foraging distance of 5-8km during winter season. Therefore, adopting this approach, anything beyond a 15km radius has not been included in this report as it lies beyond the zone of impact.

Designated sites within 15km of the proposed development are listed in **Table 7- 5**, along with their qualifying features (SCIs) and distance to the proposed development. This table establishes if designated sites are within the ZOI, which determines whether they will be considered further. It is noted that SPAs have been assessed in a standalone NIS, and so have not been considered in any more detail in this document. This is in line with EPA (2017) guidance, which states that a biodiversity section of an EIAR should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement, but it should refer to the findings of that separate assessment.

Table 7- 5 Summary of sites of International and National importance within 15km of the proposed development

Designated Site	Site Code	Reason for site selection	Site considered further (Yes/No)
Meentygrannagh Bog SAC and pNHA	000173	Red grouse breeds within the site.	No: The primary reason for the selection of this site are peat habitats. pNHA is located 145m west of the site. A small portion of this pNHA (ca. 2ha.) is hydrologically linked with the subject site, but habitats used by birds in this part of this site will not be adversely affected by the proposed development.
Tullytresna Bog pNHA	001870	The bog supports red grouse and snipe. It has been reported by NPWS staff that the site also supports merlin.	Yes: pNHA is adjacent to the south of the site. The proposed development is potentially within the core foraging range of merlin from a nest site during breeding season i.e. 5km.
Derryveagh and Glendowan Mountains SPA	004039	The site is of high ornithological importance, with nationally important concentrations of several scarce upland and woodland species occurring, including golden plover, ring ouzel and wood warbler. Four of the species that occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. red-throated diver, peregrine, merlin and golden plover and two red-listed species, red grouse and ring ouzel also occur. Glenveagh National Park is the central location for the golden eagle re-introduction programme, which commenced in 2000. Four to five pairs of golden eagle were reintroduced and it appears that the species is not doing well i.e. successfully reproducing at a higher rate than mortality rate The site is also classified for dunlin.	No: SPA is located 5.5km to the northwest of the site. This site has been assessed in the NIS. The NIS concluded that the proposed development will not adversely effect the integrity of this SPA.
Cloghernagore Bog and Glenveagh National Park SAC	002047	The SAC site is of great scientific and conservation value, particularly for the large areas of excellent, little-damaged blanket bog it contains, including the largest intact area of blanket bog in northwest Ireland. It also includes good quality examples of semi-natural deciduous woodland, heath, oligotrophic lakes and inland cliffs. The importance of the site is increased by the presence of a wide range of plant and animal species, including many rare or threatened Red Data Book species, and several that are listed on Annex II of the EU Habitats Directive or Annex I of the EU Birds Directive.	No: The SAC has been assessed in the NIS, which concluded that the proposed development will not adversely effect the integrity of this SPA.

Designated Site	Site Code	Reason for site selection	Site considered further (Yes/No)
Cloghernagore Bog and Glenveagh National Park pNHA	002047	The pNHA component largely overlaps with the Derryveagh and Glendowan Mountains SPA (see above).	Yes: pNHA is located 5.5km to the northwest of the site. Red-throated diver of conservation interest in this pNHA has a core foraging area greater than the distance to the proposed development i.e. (generally <8km).
River Swilly Valley Woods pNHA	002011	The River Swilly Valley Woods NHA consists of ten separate fragments of woodland, including native trees such as hazel, ash and oak. It provides a valuable refuge for flora and fauna in the area.	No: pNHA is located 3.2km northeast of the site. The hydrological link between the subject site and this pNHA is related to the alternative grid connection option, where there is a crossing of a 1st order stream in the Lowmagh River catchment, and where drainage from most of this option is to the Lowmagh catchment. Given the distance between the proposed works and small carrying capacity of the streams connecting this aspect of the proposed development to the pNHA, there will be no significant water quality impacts on the River Swilly. Habitats of birds in this pNHA will not be affected.
Lough Swilly SPA	004075	Lough Swilly SPA is of major ornithological importance for wintering waterbirds, with three species occurring in numbers of international importance and 18 occurring regularly in numbers of national importance.	No: SPA is located 14.2km to the northeast of the site. This SAC has been assessed in the NIS. The NIS concluded that the proposed development will not adversely effect the integrity of this SPA.
Lough Swilly Including Big Isle, Blanket Nook & Inch Lake pNHA	000166	There is no site synopsis available for this site, so the conservation interests are taken as those for Lough Swilly SPA	No: pNHA is located 14.2km to the northeast of the site. There is a hydrological link between the subject site and this pNHA (via the headwaters of the Lowmagh River) but relates only to a small component of the proposed development (mostly associated with the alternative grid connection option), so water quality impacts on habitats used by birds is not considered an issue. The distance between the proposed development and the pNHA is greater than the core foraging range of all bird species listed as SCI within the Lough Swilly SPA, except for greylag goose *Anser anser* (core foraging range from night roost during winter season of 15-20km). This species was not recorded during surveys at the proposed development site and the site does not contain suitable habitat for the species.

7.2.1.1 Sites of International Importance

Special Protection Areas (SPAs) and candidate Special Protection Areas (cSPAs) are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC) and Birds Directive (2009/147/EC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997 and the Planning and Development Act 2000, as amended. **Figure 7- 3** and **Figure 7- 4** show the designated sites within a 15km radius of the proposed development.

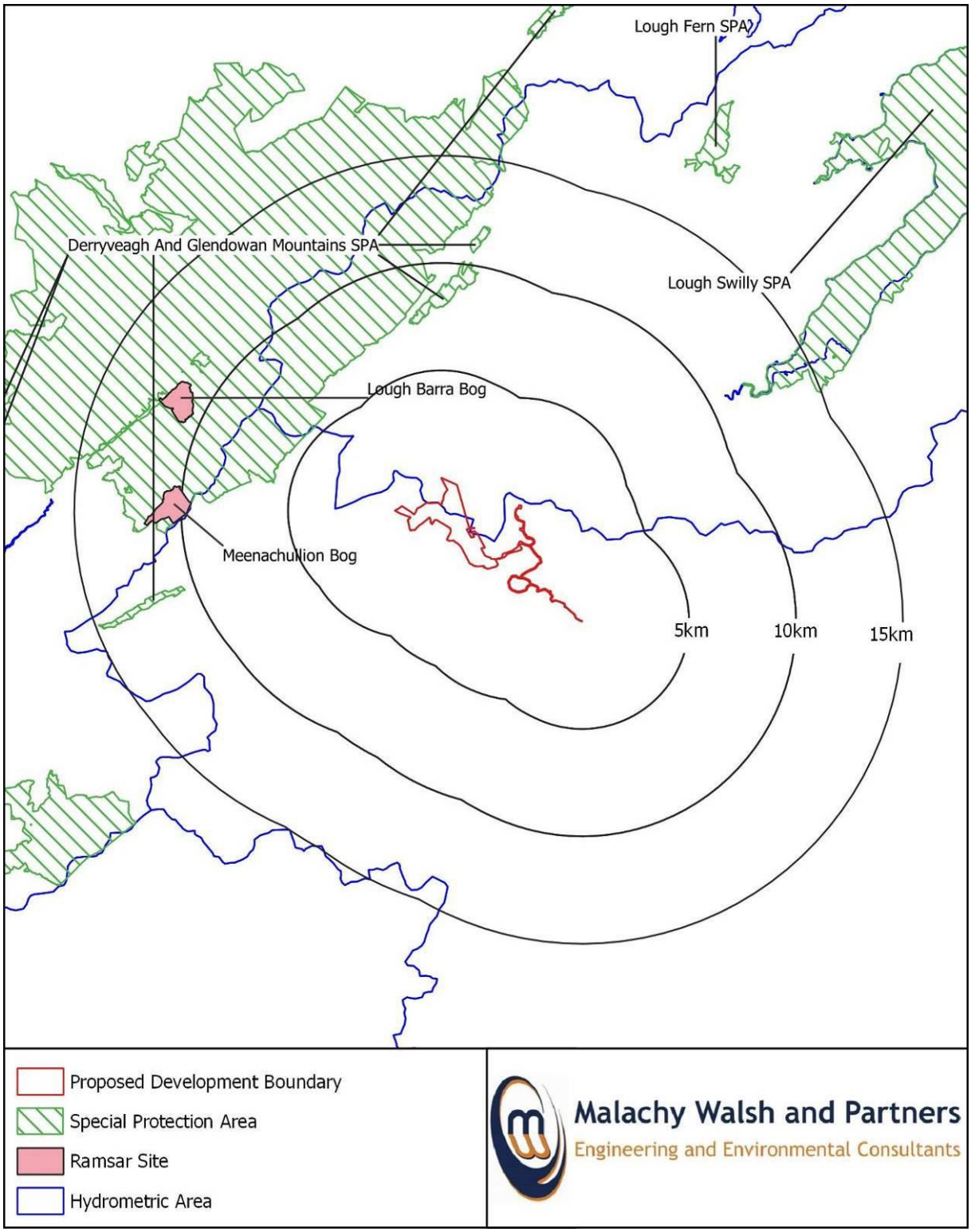

Figure 7- 3 Natura 2000 sites within 15km of the proposed development.

Derryveagh and Glendowan Mountains SPA (004039) is located 5.5km northwest of the proposed development site. The Special Conservation Interests (SCIs) of this site are red-throated diver, merlin, peregrine, golden plover and dunlin. Lough Swilly SPA (004075) is located 14.2km northeast of the proposed development site, and the SCIs are great-crested grebe (*Podiceps cristatus*), grey heron (*Ardea cinerea*), whooper swan (*Cygnus cygnus*), greylag goose, shelduck (*Tadorna tadorna*), wigeon (*Anas penelope*), teal (*Anas crecca*), mallard (*Anas platyrhynchos*), shoveler (*Anas clypeata*), scaup (*Aythya marila*), goldeneye (*Bucephala clangula*), red-breasted merganser (*Mergus serrator*), coot (*Fulica atra*), oystercatcher (*Haematopus ostralegus*), knot (*Calidris canutus*), dunlin, curlew (*Numenius arquata*), redshank (*Tringa totanus*), greenshank (*Tringa nebularia*), black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*), sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*), Greenland white-fronted goose and 'Wetland and Waterbirds'. Lough Nillan bog SPA (004110) is located 19.7km to the southwest of the proposed development site. The SCIs of this site are merlin, golden plover, Greenland white-fronted goose and dunlin. The NIS concluded that the proposed development will not will not adversely affect the integrity of these SPAs.

7.2.1.2 Sites of National Importance

In Ireland, sites of National importance are termed Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA). Prior to statutory designation, pNHAs are subject to limited protection.

There are eleven pNHAs, three NHAs and one National Park (Glenveagh) within 15km of the proposed development site. Tullytresna Bog pNHA is adjacent to the proposed development site. Some sites such as Lough Akibbon and Gartan Lough pNHA and Lough Finn pNHA are not indicated as supporting important bird populations and therefore not included in **Table 7- 5**.

<u>Tullytresna Bog pNHA</u>

This pNHA is adjacent to the south of the proposed development site. This site is of ecological importance as an example of intact highland blanket bog and supports red grouse and snipe. It has been reported by NPWS staff that the site also supports merlin. The proposed development is potentially within the core foraging range of merlin from a nest site during breeding season i.e. 5km.

<u>Meentygrannagh Bog pNHA</u>

Meentygrannagh Bog pNHA is located 1km to the northwest of the site. A characteristic peatland fauna occurs, with red grouse, Irish hare and common frog all breeding within the site.

<u>Cloghernagore Bog and Glenveagh National Park pNHA</u>

Derryveagh and Glendowan Mountains SPA shares a similar boundary with this pNHA. A Natura Impact Statement (NIS) has been prepared to determine whether the project will adversely affect the integrity on any relevant European including the Derryveagh and Glendowan Mountains SPA, in view of that site's conservation objectives. The NIS concluded that the project will not adversely affect the integrity of the SPA.

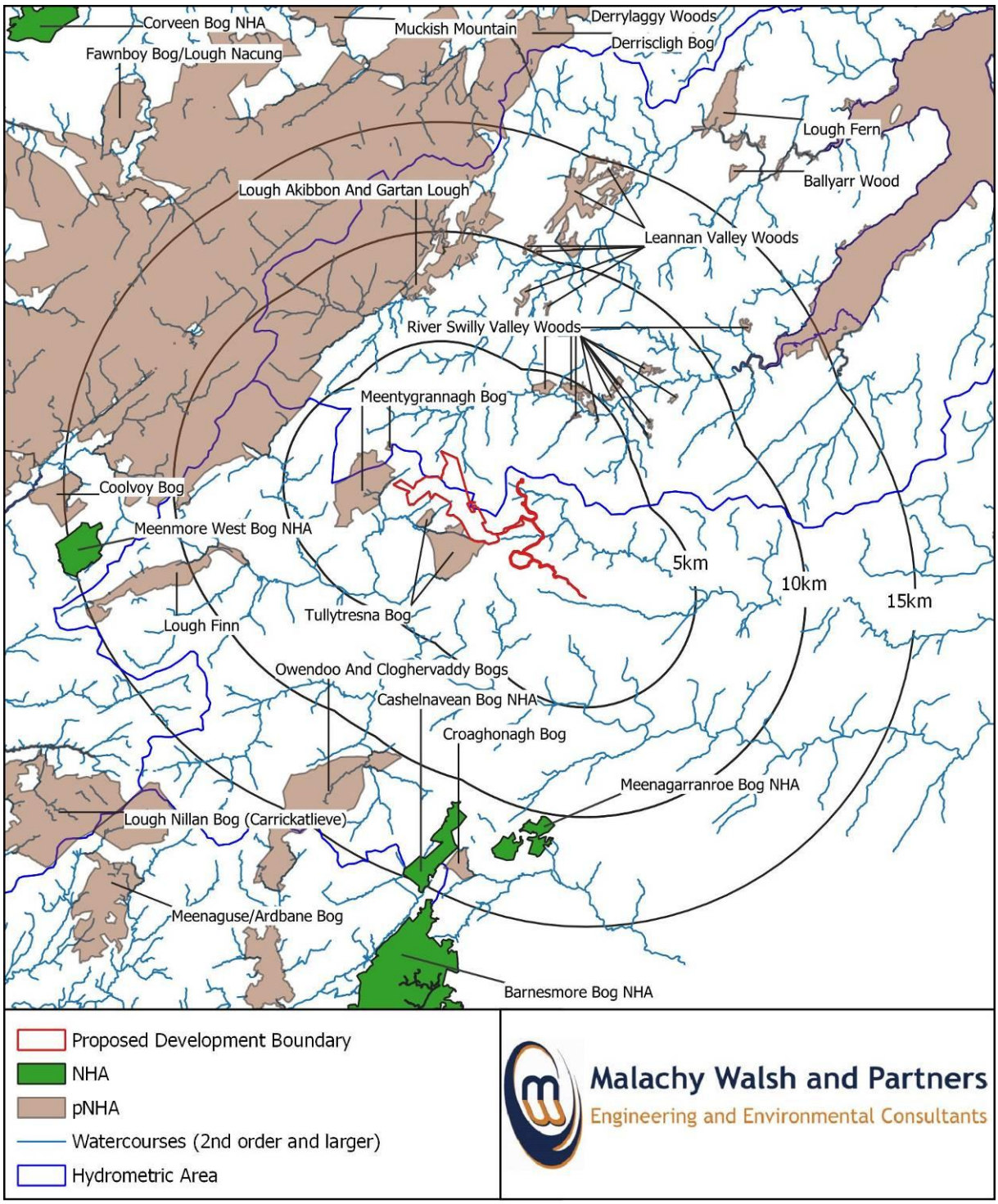

Figure 7- 4 Natural Heritage Areas (NHAs) and pNHAs within 15km of the proposed development[2].

Cloghernagore Bog and Glenveagh National Park pNHA_is located 5.5km to the northwest of the proposed development site. This site is an extensive upland site in northwest Co. Donegal, comprising Glenveagh National Park, a substantial part of the Derryveagh and Glendowan

[2] Some sites such as Lough Akibbon and Gartan Lough pNHA and Lough Finn pNHA are not indicated as supporting important bird populations but have been included.

Mountains and a number of the surrounding lakes. The substrate over much of site is peat, with blanket bog and heath comprising the principal habitats.

The site supports good examples of both upland and woodland bird communities. It supports nationally important populations of breeding red-throated diver, merlin, peregrine, golden plover and dunlin. There is a hydrological connection between the proposed development site and the SPA through the Elatagh River, this watercourse draining parts of both areas. Given the intervening distance and lack of a hydrological pathway between the proposed development site and the pNHA, the proposed development will not negatively affect supporting habitats of these species.

An account of the SCIs are detailed below in relation to ecology and distribution.

7.2.1.3 Additional Important Sites

Ramsar Sites/Important Bird and Biodiversity Areas

The Convention on Wetlands of International Importance especially as Waterfowl Habitat, more commonly known as the Ramsar Convention, was ratified by Ireland in 1984 and came into force for Ireland on 15 March 1985. Ireland presently has 45 sites designated as Wetlands of International Importance, with a surface area of 66,994 hectares. There are two Ramsar sites within 15km of the proposed development: Meenachullion bog (code 475) and Lough Barra bog (code 373), located ca. 9km and 11km to the west respectively. Meenachullion bog is important as various breeding birds use the site and a small flock of Greenland white-fronted goose *Anser albifrons flavirostris* occurs in winter[3]. Lough Barra bog is important for breeding birds including merlin and golden plover, and a wintering flock of the Greenland white-fronted goose[4].

Bird Life International has produced a compendium of Important Bird Areas (IBAs) in Europe. The IBA programme of BirdWatch Ireland is a worldwide initiative aimed at identifying and protecting a network of critical sites of importance for birds. There are 156 IBAs in Ireland including 140 in the Republic of Ireland and 16 in Northern Ireland, 122 of which support wintering water birds. There are two IBAs within 15km of the proposed development site: Glenveagh National Park (site code IEO16) and Lough Barra bog (IEO17), located in excess of 10km northwest of the proposed development. Glenveagh National Park is important for woodlands, boglands and freshwater habitats but is most notable for its reintroduced and breeding golden eagle.

I-WeBS Sites within 20km

I-WeBS (Irish Wetland Bird Survey) is a joint project between BirdWatch Ireland and National Parks and Wildlife (NPWS) in which specific wetland sites are surveyed (BirdWatch Ireland, 2019). In order to count the wetland birds a 'look-see' method is used in which all birds present within a pre-defined area are counted. The aim of these surveys is to monitor non-breeding birds in Ireland and contribute to population counts and it is also important to help assess the quality of these wetland areas (BirdWatch Ireland, 2019). The bird groups to be counted for I-WeBS consist of swans and geese, ducks, divers, waders and gulls. Counts are made once per month from September to March annually (BirdWatch Ireland, 2019)[5].

[3] https://rsis.ramsar.org/ris/475
[4] https://rsis.ramsar.org/ris/373
[5] https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/.

There are four I-WeBS[6] sites within 20km of the study area as listed in **Table 7- 6**.

Table 7- 6 I-WeBS sites within 20km of the proposed development site

I-WeBS Site	Proximity to proposed development site
Site: Gartan Lough (Site code – 0AS10) Sub-site: Gartan Lough	Located 8km north of the site.
Site: Loughs Akibbon & Nacally (Site code – 0A003) Sub-site: Loughs Akibbon & Nacally	Located 10km north of the site. Tufted Duck is the only species listed for the Loughs Akibbon & Nacally I-WEBS site.
Site: Lough Swilly (Site code – 0A486) Sub-site: Lough Swilly Estuary Site: Lough Swilly (Site code – 0A494) Sub-site: Big Isle	Located 14km northeast of the site Located 17km northeast of the site Lough Swilly I-WEBS site has an extensive list (95) of species which includes national and international counts ranging from 2006/07 to 2015/16. A full list of these species can be found: https://f1.caspio.com/dp/f4db3000060acbd80db9403f857c

7.2.2 Proposed Development Site Description

This section describes the existing environment at and within the environs of the proposed development site. The diversity, range and relative abundance of species recorded in the survey area reflect the type and relative proportions of habitats available to birds, as influenced by landuse factors. The upland windswept and modified character of habitats which encompass much of the of the proposed development site results in impoverished habitats for many faunal species. The site is underlain with blanket peat that historically supported peatland habitats, which have been developing in Ireland over thousands of years. Today, most of the proposed development site is afforested, owned and managed by Coillte. The site was initially planted with commercial forestry in 1968/69 and some in the early 1970's. Most of the forestry within the proposed development site is currently in its second rotation apart from the eastern part which was planted in the early 1990's.

The commercial forestry accounts for the occurrence of (specialist) species including redpoll (*Acanthis flammea*), common crossbill (*Loxia curvirostra*) and siskin (*Carduelis spinus*), as well as the expansion of local populations of common species such as chaffinch (*Fringilla coelebs*), robin (*Erithacus rubecula*), coal tit (*Parus ater*) and wren (*Troglodytes troglodytes*). The combination of closed canopy coniferous forest with shrub-level new and second rotation conifer plantation, as well as unplanted areas (e.g., peat habitats) now affords structural and ecological variation that suits adaptable species such as kestrel and stonechat. Hen harrier and merlin may also benefit from temporal availability of breeding sites and foraging habitat in conifer plantation, but for these and other species extensive open moorland is essential habitat.

Commercial forests are highly dynamic in terms of temporal changes in habitat character – as the canopy closes in maturing forest and other areas are felled, local bird populations will be affected. As the areas involved tend to be large, such changes can have far reaching influences on the avifauna ecology as a whole, bearing in mind predator-prey relationships for

[6] https://bwi.maps.arcgis.com/apps/View/index.html?appid=1043ba01fcb74c78bc75e306eda48d3a

example.

While conifer plantation may have created new bird habitats, they have resulted in the loss of upland moorland habitat for true upland species which would previously have inhabited the area, particularly golden plover and red grouse. Moreover, forest habitat and sheep stocking (carrion) may encourage predator numbers to a disproportionate level, particularly fox (*Vulpes vulpes*), hooded crow (*Corvus cornix*) and raven (*Corvus corax*), affecting vulnerable ground-residing species such as golden plover, red grouse, skylark and snipe (Thompson *et al*. 1988).

7.2.3 Bird Records and Distribution

The following sections provide bird records and distribution at the proposed development site, neighbouring wind farm sites and the wider study area.

The entire study area lies within the 10km hectad C00. **Table 7- 7** outlines all species which have been previously recorded in the relevant hectad C00 and which are either of conservation concern and/or are afforded a higher level of legislative protection in an Irish or European context, including their wintering and breeding status.

Table 7- 7 Bird Atlas (2007-2011) status of species previously recorded in the 10km hectad C00

Species Common Name	Winter Atlas '07-11	Breeding Atlas '07-11	Conservation/Protection Status
Grey Heron	Present	Absent	BoCCI Green-listed/4th schedule of the WA[7] 1976, 2012
Mallard	Present	Present	BoCCI Green-listed/Annex II & Annex III EU Birds Directive
Hen Harrier	Present	Absent	BoCCI Amber-listed/ Annex I EU Birds Directive
Eurasian Sparrowhawk	Absent	Probable	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Common Buzzard	Present	Possible	BoCCI Green-listed/4th schedule of the WA 1976, 2012
Common Kestrel	Present	Absent	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Merlin	Absent	Confirmed	BoCCI Amber-listed/ Annex I EU Birds Directive
Red Grouse	Present	Possible	BoCCI Red-listed/ Annex II & Annex III EU Birds Directive
Common Pheasant	Present	Absent	BoCCI Amber-listed/ Annex II & Annex III EU Birds Directive
Common Snipe	Present	Absent	BoCCI Amber-listed/ Annex II & Annex III EU Birds Directive
Eurasian Woodcock	Present	Confirmed	BoCCI Amber-listed/ Annex II & Annex III EU Birds Directive
Rock pigeon/dove	Present	Absent	BoCCI Green-listed/Annex II and III EU Birds Directive
Common Wood pigeon	Present	Probable	BoCCI Green-listed/Annex II EU Birds Directive
Common Cuckoo	Absent	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Skylark	Present	Probable	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Swallow	Absent	Confirmed	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
House Martin	Present	Absent	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Meadow Pipit	Present	Confirmed	BoCCI Red-listed/ 4th schedule of the WA 1976, 2012
Grey Wagtail	Present	Confirmed	BoCCI Red-listed/ 4th schedule of the WA 1976, 2012

[7] WA = Wildlife Act

Species Common Name	Winter Atlas '07-11	Breeding Atlas '07-11	Conservation/Protection Status
White Wagtail	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Dipper	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Winter Wren	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Dunnock	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
European Robin	Present	Confirmed	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Stonechat	Absent	Confirmed	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Northern Wheatear	Absent	Confirmed	BoCCI Amber-listed/4th schedule of WA 1976 and 2012
Common Blackbird	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Fieldfare	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Song Thrush	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Mistle Thrush	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Willow Warbler	Absent	Probable	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Goldcrest	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Spotted Flycatcher	Absent	Confirmed	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Long-tailed Tit	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Coal Tit	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Blue Tit	Present	Probable	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Great Tit	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Eurasian Treecreeper	Present	Absent	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Magpie	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Eurasian Jackdaw	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Rook	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Common Raven	Present	Probable	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Common Starling	Present	Confirmed	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
House Sparrow	Present	Confirmed	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Chaffinch	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
European Greenfinch	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
European Goldfinch	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Eurasian Siskin	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Common Linnet	Absent	Probable	BoCCI Amber-listed/4th schedule of the WA 1976, 2012
Common Bullfinch	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Reed Bunting	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Hooded Crow	Present	Confirmed	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012
Lesser Redpoll	Present	Possible	BoCCI Green-listed/ 4th schedule of the WA 1976, 2012

FTC 2006 and 2008 bird survey results

Fehily Timoney & Company (FTC) carried out bird surveys between 2006 and 2008 as part of the Environmental Impact Statement for the previously permitted Drumnahough Wind Farm at the site for Airtricity/SSE & Coillte published in 2008. The most notable species recorded are listed in **Table 7- 8** below.

One observation of an adult red-throated diver in June 2006 was made at Lough Deele, however, there were no indications of a breeding site in this area and the bird was regarded as a non-breeder (FTC, 2008).

Whooper swans were recorded on Lough Deele (east of the site) in small numbers from winter to spring 2006-2007 (FTC, 2008). It was determined there was regular occurrence on autumn and spring passage and periodically during the winter.

Greenland white-fronted goose were observed on one date in April 2008 in which four flocks were seen flying in the same direction (south/southeast - north/northwest) and in close succession most likely on northward migration (FTC, 2008). These flocks flew over the proposed development site, passing from Meenbog and Tullytresna onward to over Cronaglack. The flocks were traversing the district within a period of one hour, flying a straight trajectory tracked over about 15 - 20 km (within visible range of optics). Flight altitude varied somewhat among the flocks, between an estimated 500 to 900 m over datum. Greenland white-fronted goose are a winter-visitor throughout Ireland but with a large proportion of birds at the Wexford North Slobs. They are Annex I and amber-listed species in Ireland.

Hen harrier *Circus cyaneus* sightings were infrequent but they were seen consistently throughout the survey years 2006/2007/2008 (FTC, 2008).

Table 7- 8 Most notable species recorded during 2006 - 2008 bird surveys (Source: FTC, 2008)

Species	Notes
Golden plover	Golden plover were recorded most often during the winter-spring period. As no definitive evidence was found to suggest there is breeding close to or within the site breeding could not be confirmed.
Greenland white-fronted goose	This species was only observed on one date in April 2008 in which four flocks were seen flying in the same direction (south/southwest - north/northwest) and in close succession most likely on north-ward migration.
Hen harrier	Hen harrier sightings were infrequent but were seen consistently throughout the survey years 2006/2007/2008.
Merlin	There were a few sightings during the survey period to suggest there was a possible breeding pair in the area although no nest was located upon investigation.
Peregrine	Peregrine was only seen rarely during the survey period. It was determined that the site itself lacked potential breeding sites for this species.
Red grouse	Grouse were flushed on a few occasions during walk over surveys and heard calling. Due to the variable heather cover in the area, it was considered likely this species was localised and sparsely distributed.
Snipe	Snipe were widespread in areas of wet bog and flushed and a number of breeding territories were located.
Whooper swan	Whooper Swans were recorded on Lough Deele (east of the site) in small numbers from winter to spring 2006-2007. It was determined there was regular occurrence on autumn and spring passage and periodically during the winter.
Red-throated diver	One observation of an adult in June 2006 at Lough Deele.

7.2.3.1 Bird Survey Results

The target and secondary species recorded during bird surveys carried out at the proposed development site during the summer and winter 2018 and 2019 period are presented in **Table 7- 9**.

These tables combine results from VP watches, transect, point count and walkover surveys and incidental sightings. Detailed survey results are presented in **EIAR Volume 3 Appendix D-8 to Appendix D-11**. A brief account of the target species is given below.

Table 7- 9 Target and secondary species recorded during all bird surveys carried out at the Drumnahough wind farm site during the 2018 and 2019 breeding seasons, and the 2018/19 and 2019/20 winter seasons (Annex I species are highlighted in bold).

Species	2018 breeding	2018/19 winter	2019 breeding	2019/2020 winter
Buzzard	✓	✓	✓	✓
Merlin	✓	✓	✓	✓
Peregrine	✓		✓	✓
Kestrel	✓	✓	✓	✓
Sparrowhawk	✓	✓	✓	✓
Golden eagle			✓	✓
Golden plover	✓	✓	✓	
Hen harrier			✓	
Snipe	✓		✓	
Goosander		✓		
Great black-backed gull	✓		✓	✓
Lesser black-backed gull	✓	✓	✓	✓
Grey heron	✓	✓	✓	
Teal	✓		✓	
Mallard	✓	✓	✓	
Whooper swan	✓			✓
Woodcock				✓
Red grouse				✓
Meadow Pipit	✓	✓	✓	✓
Grey Wagtail			✓	✓

Twelve target species were recorded during vantage point surveys carried out for the Drumnahough wind farm site during the 2018 breeding season. The most notable species recorded comprised of merlin and golden plover, both of which are listed on Annex I of the EU Birds Directive. These species were recorded inside and outside the site boundary and occasionally passed through or flew across the proposed development site. Merlin have been recorded nesting just north of VP2 in 2018 (as shown on **Figure 7-4**).

Nine target species were recorded during vantage point surveys carried out at the site during the 2018/2019 winter season. The most notable species recorded comprised of merlin, golden plover and whooper swan, all of which are listed on Annex I of the EU Birds Directive. Merlin was recorded inside the site boundary, golden plover were recorded inside and outside the site boundary and Whooper swan was only recorded west of the site outside the boundary.

Twelve target species were recorded during vantage point surveys carried out for at the site during the 2019 breeding season. The most notable species recorded comprised of golden eagle and merlin, both of which are listed on Annex I of the EU Birds Directive. Merlin was recorded inside the site boundary and the golden eagle was recorded inside and outside the site boundary.

Nine target and secondary species were recorded during bird surveys carried out at the site during the winter 2019/20 survey season. The most notable species were golden eagle and hen harrier.

Buzzard

Buzzard is a green-listed species in Ireland and has become common in this region of Donegal. Birds were often noted on the outskirts of the site boundary and frequently at the site, either hunting or soaring over the site. Buzzards were observed from all VP locations. One possible pair bred within a spruce plantation to the west of the proposed development site. Buzzards nested in the area between VP1 and VP4.

Merlin

Merlin is an amber-listed species in Ireland and are also an Annex I species. In the summer of 2018, a Merlin nest was recorded just northwest of VP2 (ca. 400m north of T4), where adults were observed bringing food back and forth intermittently to an area of young spruce on a couple of occasions during the breeding season. Since breeding in 2018, adult merlin activity has been recorded in winter 2018/19 and summer 2019 with all observations occurring exclusively at VP2. Nesting in this area continued in 2019 and 2020. The merlin at this location were nesting on the ground, noting that this species is also known to nest in trees. There were no juveniles recorded at the site during the 2019 breeding bird survey, however, there was an observation of a juvenile flying in a westerly direction towards the site whilst a surveyor was carrying out a VP watch at the neighbouring permitted Lenalea Wind Farm in July 2019. Merlin nest sites are typically restricted to deep heather, but they will also use old crow nests both in more mature forestry blocks and in scattered trees on moorland. The nest location within the proposed development site was deemed to be situated in an area of young (pre-thicket) 2nd rotation forestry / firebreak. Ornithologists did not pin-point the location of the nest to avoid unnecessary disturbance or accidental damage to the nest.

Merlin specialise in catching small birds that they hunt over open ground, along forest edges, or sometimes over the canopy (SNH, 2016b). The breeding season diet of merlin was assessed at 11 occupied sites in 2010 by Fernández-Bellon and Lusby (2011)[8], where diet was determined via analysis of prey remains. Open-country passerines comprised the majority of the diet (45% by number and 62% by weight). Predominance of meadow pipit and skylark, reported as the main prey species by previous studies, was significantly lower in the Fernández-Bellon and Lusby (2011) study. This may be linked to population declines of these passerines as a consequence of recent harsh winter weather. Woodland passerines accounted for approximately half of the diet in April with their relative importance declining steadily as the season progressed. Nestling and fledgling passerines were an important food source for merlin in the later part of the season.

The open habitats underlain by peat at the proposed development site are suitable for the merlin quarry species skylark, meadow pipit, chaffinch, wheatear and pied wagtail, the former two in general decline across Ireland. Younger stands of commercial forestry provide an additional range of prey e.g. crossbill, chaffinch, coal tit, goldcrest, grasshopper warbler.

[8] https://ornithology.ucc.ie/wp-content/uploads/sites/41/2015/11/Fernandez_Bellon__Lusby_2011_*F_columbarius*_diet.pdf

Peregrine

There was only one incidental observation of peregrine falcon, a species green listed in Ireland. This adult male was observed early to the west of VP2 during the 2019 breeding season.

Kestrel

Kestrel is an amber-listed species and common localised breeder in this region of Donegal with small numbers frequenting this site. Kestrels were observed within the site. This species is considered to be breeding locally but no nesting was recorded within the site.

Sparrowhawk

Sparrowhawk is an amber-listed species and a common localised breeder in this region of Donegal, with small numbers frequenting this site on a regularly basis. Sparrowhawk were recorded observed from all VP locations. This species was considered to be nesting in mature coniferous forestry west of VP2 during the 2019 breeding season.

Golden eagle

Golden eagle is Ireland's largest bird of prey and a red-listed species. Eagles were formerly bred in Ireland and recently re-introduced into Donegal. Wandering birds from this re-introduction project have been observed in upland areas throughout Ireland. Overall, golden eagles were recorded four times: twice in the month of April and twice in the month of September during the 2019 breeding season and the 2019/2020 winter season, respectively. All sightings during 2019 appeared to be a 2nd calendar year bird. This bird landed within the proposed development site and was pestered by corvids on one occasion during 2019.

No evidence of breeding or roosting activity was recorded within the study area, though flights were observed within the proposed development site. Deer hunting in the area is carried out under licence and disembowelment and field dressing of deer in the study area was indicated by surveyors as a reason for the golden eagle to have been attracted into the area. As well as natural mortality of deer, remains of deer left in this way by hunters are an important food source for golden eagle during the winter/spring period.

Golden plover

Golden plover is a red-listed species and listed on Annex I of the EU Birds Directive. This species was recorded on five occasions as follows:

- On 10th April 2018 at VP2 a flock of 12 golden plover flew 600m west of VP2 at a height of 200-300m;
- On 11th April 2018 at VP2, a flock of 35 golden plover were observed flying in a west to east direction along a hill ridge to the north of VP2. They flew in a V formation at a height of 200m over the hill to the north;
- On 20th March 2019 at VP3 a flock of 30 golden plover were observed circling to the south/southwest of VP3 at heights between 100-150m;
- On 21st March 2019 at VP1 a flock of 39 golden plover were observed to the north/north-east circling of VP1 before flying north;
- On 22nd March 2019 at VP1 a flock of 40 golden plover were observed to the south of VP4 circling at heights greater than 150m.

These birds were likely dispersing to breeding grounds from wintering grounds in Ireland or passage birds returning to Icelandic breeding grounds. The windfarm site is not of foraging significance to the species but the species does pass through the site. No evidence of breeding activity was recorded.

Snipe

Snipe are an amber-listed wader occasionally recorded at the site. Snipe were recorded five times and were observed at VP1, VP3 and VP4 during summer 2019 in the months of April, May and June, and were considered breeding at the site.

Snipe forage across a variety of wetland and damp habitats and generally under recorded during surveys as they are not easily seen, unless flushed out of marshy vegetation. Snipe are very difficult to detect on standard VP watches (a significant proportion of display and other flight activity is crepuscular or is in weather of reduced visibility) and are unlikely to be meaningfully recorded. Some display flight activity will be at collision risk height (SNH, 2014)[9].

Goosander

Goosander (*Mergus merganser*) was recorded just once in January 2019 from VP4. Goosander is an amber-listed species, according to BirdWatch Ireland (2019) they are known to frequent large lakes in Donegal and Wicklow.

Hen Harrier

This species was only observed once during the two years of bird survey work carried out at the site. This was a female bird observed from VP1 in September 2019, which flew north through the proposed development site. Flight height was low, 2-5m off the ground through grassland moorland while hunting. Hen harrier is amber-listed and Annex I listed species.

Great black backed gull

Great black-backed gull is an amber-listed species occasionally recorded at the proposed development site. Overall, great black-backed gull were recorded four times and were observed from VP1, VP3 and VP4 (outside the site boundary). No evidence of breeding or roosting activity was recorded within the study area.

Lesser black-backed gull

This species is amber-listed and occasionally recorded at the proposed development site. Lesser black-backed gull were recorded twice and were observed at VP2 and VP4 only during summer 2018. This species was recorded just once in March at VP2 during 2018/19 (within the site) and once during summer 2019 (outside the site). No evidence of breeding or roosting activity was recorded within the study area.

[9] https://www.nature.scot/sites/default/files/2017-09/Guidance%20note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf

Woodcock

Red listed woodcock was flushed from wet grassland to the west of the alternative grid option during a walkover survey in December 2019.

Red grouse

Red grouse is a red-listed species of conservation concern and was recorded in the study area during summer 2019. This bird was heard calling east and south of VP1 and was considered outside the proposed development site. Commercial forestry and open peatland habitats occurred in the approximate location of this bird but was likely utilising its preferred habitat with heather cover i.e. open peatland.

Teal

Teal (*Anas crecca*) activity was recorded on one occasion in the month of May at VP5. An individual was seen north of VP flying west to east across the southern shore of Lough Deele. Teal are an amber-listed species in Ireland.

Whooper swan

Whooper swan is a winter-visitor throughout Ireland and are Annex I and amber-listed in Ireland. During the 2019/2020 winter season surveys, whooper swan activity (a small flock of 2 adults and 1 juvenile) was recorded in the months of October, December and January on 6 occasions; once at VP3 and five times at VP5.

On 21st March 2019, a flock of 53 whooper swans were seen flying to the west of the proposed development site in a north-easterly direction over improved grassland, grassland moorland and bog at height of ca. 150m. The group then gained height to 250m as they flew over a valley before dropping down to 150m again.

Whooper swan was recorded just once in March at VP4, to the southwest of the proposed development site. Whooper Swan is an amber-listed species and is a winter visitor throughout Ireland.

Grey heron

Grey Heron is a green-listed common resident at wetlands, estuaries and along rivers throughout Ireland. They are found in the same wetland habitats during the winter as in the breeding season. This species was recorded flying within the proposed development site and also at Lough Deele to the east.

Mallard

Mallard is a green-listed species occurring in almost all available wetland habitats in Ireland. They are green listed and are the most widespread species according to Birdwatch Ireland. This species was recorded flying within the proposed development site and also at Lough Deele to the east.

Passerines

Meadow pipit (red-listed) was recorded almost every month throughout the site during the summer 2018 and 2019 seasons. This species was associated with open heathland, early stage 2nd rotation forestry, firebreaks and roadways/tracks. Whinchat *Saxicola rubetra*, an amber listed species was recorded nesting ca. 5.5km northwest of the site during the 2019 breeding season. Amber-listed

non-target species most frequently recorded included goldcrest *Regulus*, linnet *Carduelis cannabina*, robin *Erithacus rubecula* and starling *Sturnus vulgaris*. Amber-listed species less frequently recorded included swallow *Hirundo rustica*, skylark *Alauda arvensis* and mistle thrush *Turdus viscivorus*. The least commonly recorded species comprised sand martin *Riparia riparia*, stonechat *Saxicola torquata*, swift *Apus* and common sandpiper *Actitus hypoleucos*.

Other species

Incidental species encountered during the summer 2019 surveys consisted of curlew which is red-listed. A pair of curlew was recorded nesting ca. 5km northwest of the site during the 2019 breeding season. There is no evidence of regularly occurring curlew at site. Red-legged partridge *Alectoris rufa*, an introduced species, were recorded in a number of pens less than 1km west of site.

7.2.3.2 Neighbouring Wind Farms

Lenalea Wind Farm (permitted)

Lenalea Wind Farm is located ca. 2km east of the proposed Drumnahough site. The habitat at this site is dominated by conifer with some open peatland habitats. FTC (2008) compiled an EIS for Lenalea Wind Farm. Some construction work has been completed at the site and is due to resume in early 2021. Bird survey work commenced in 2006 and is ongoing. A total of 38 bird species were recorded in the April – July period (2006 and 2007). The most important findings were as follows:

- Small numbers of whooper swans were recorded on Lough Deele in 2006 and 2007, from winter to spring. Numbers varied on different occasions through the season. The maximum number recorded was 18 birds (in April 2006). The records would indicate regular occurrence on autumn and spring passage and periodically during the winter.
- Greenland white-fronted goose: This species is not known to use the site or local habitats over winter. During other site surveys, flocks of Greenland white-fronted goose totalling 280 birds were seen on one occasion (on 3rd April 2008), over-flying the uplands 4 km to the west, on spring migration to the NNW.
- One adult red-throated diver was recorded on Lough Deele on 27th June 2006. The bird was quite inactive on the lake. This was an unexpected observation. There are no indications of a breeding site in this area.
- Infrequent hen harrier sightings.
- One merlin and one peregrine falcon observation.
- No sightings of golden plover.
- Red grouse was observed occasionally on the Cark ridge but was otherwise not detected in the Lenalea Wind Farm site area during the survey.

MWP conducted bird surveys at the Lenalea Wind Farm site from April 2018 until March 2019. The summer 2018 breeding findings are summarised as follows:

- Golden plover were seen in the months of April and September. Flight heights ranged between 0-150m.
- Grey heron were seen in months of April and May. Flight heights ranged between 1-20m.
- Mallard were seen in the month of May. Flight height ranged from 0-20m.
- Merlin were seen in the month of July only at VP1/ Flight height ranged between 3-5m.

- Peregrine were seen in the months of April and August at VP2 and VP4, respectively. Flight height ranged between 0-20m.
- Teal were seen in the month of May only at VP4. Flight height was less than 1m above Lough Deele.

The winter 2018/19 findings are summarised as follows:

- Golden plover were seen in the months November, February and March at two of the four VP locations. Flight heights ranged between 0-150m.
- Grey heron were seen in the months of November, February and March at all four VP locations. Flight heights ranged between 0-100m.
- Mallard were seen in the month of March only at one VP location. Flight height ranged between 15-20m.
- Peregrine were seen in the month of November only at one VP location. Flight height ranged between 20-30m.
- Whooper swan were seen in the months of November and March. Flight heights ranged between 20-80m.

The 2019 summer breeding findings are summarised as follows:

- Mallard were seen in the month of June at VP3 flying at a height of 30m.
- Merlin were seen in the month of July at VP2 flying at heights between 2-6m.
- Great black-backed gull, lesser black-backed gull and grey heron seen on Lough Deele.
- Red grouse flushed.

The 2019/2020 winter season findings are summarised as follows:

- Three whooper swans (2x adults and 1x juvenile) using Lough Deele from October to January
- Lesser black-backed gull flying in a northerly direction
- Great black-backed gull recorded
- Two buzzards were observed circling over a wide area of bog and 1st rotation forest

<u>Culliagh Wind Farm extension</u>

Culliagh Wind Farm extension was developed by Airtricity/SSE and is located ca. 1km south of the proposed development. The dominant habitats are coniferous forestry and upland habitats underlain by peat. Bird survey visits to the site were made in the breeding seasons of 2006, 2007 and 2008 (FTC, 2008). The most important findings are summarised as follows:

- Two red grouse territories were evident from two separate calling males over 1 km southwest of the Culliagh Wind Farm Extension site.
- A number of less common species, which were recorded in relatively small numbers, are reliant on particular upland habitats and their related ecological attributes. The records included one pair of possible breeding golden plover (plus another uncertain record), snipe (at least one breeding record), cuckoo *Cuculus canorus* (2 breeding territories), reed bunting *Emberiza schoeniclus*, grasshopper warbler *Locustella naevia*, grey wagtail *Motacilla cinerea* and stonechat *Saxicola torquata*.
- Golden plover was not confirmed breeding, as sustained presence or other indications (e.g., territorial behaviour) was not found in the survey.

Additional data from surveys of adjacent sites were provided in the ecology chapter of the EIS as follows:

- Infrequent hen harrier observations were made in the Meenanamph – Tullytrasna area, less than 2km north of the proposed development site, each time involving an adult male hen harrier. A male hen harrier was also seen about 4km to the northeast of the proposed development site in February 2008, moving over the Lenalea area from NE to SW. Observations indicated some use of the local moorland and forestry habitats for foraging. A late evening winter observation was indicative of a possible roost site 3km to the west of the proposed development site. Hen harriers were seen only in the winter-spring pre-breeding period, between December and April. Hen harriers were seen in each of the three survey years (2006 - 2008) indicating continuous, if infrequent, occurrences in the wider locality. Ringtails (term for adult females or male/female first year juveniles having similar plumage) were seen within 10 km to the northwest of the proposed development site in 2007. Assuming these observations to be of adult female(s), breeding may have been attempted in recent season(s) within 15 km of the proposed development site, possibly at a location to the northwest / west. Indeed, an unsuccessful breeding pair was recorded in the area in May 2003.
- Golden plover were recorded recurrently at some locations over the survey period, mainly in the winter-spring period. Flocks of up to 30 - 40 birds were seen on Tullytresna (within 1 km north of the proposed development site) and on the southeastern slope of Cronaglack (within 4 km north of the proposed development site). During another survey, a flock of 90 golden plover were seen at Meenahorna in April 2007 (3 km east of the proposed development site). Other records were made at various locations in this upland district. It can be concluded that suitable habitat is used by over-wintering golden plover at different locations in this upland district. Higher numbers have been recorded in April, which may be birds on northward spring migration (e.g. Icelandic breeders). Suitable upland habitat is generally restricted to plateaux or gently sloping terrain with short vegetation above the 250m contour (Parr, 1980).
- Merlin was occasionally recorded on VP watches elsewhere in the wider locality, including observation of a female merlin flying over the summit and northwest slope of Tullytresna from the southeast, 1 km north of the proposed development site. A number of other distant or fleeting sightings could not be confirmed as merlins. These observations were made in the spring – summer period. A number of searches for breeding sites / territories and walkover survey failed to confirm breeding. Suitable habitat in the form of forest edge, wooded river-sides and valleys, and sparsely wooded derelict farmsteads (some with Corvid nests) occur in the area and many of these where checked for signs of breeding merlin.
- There are few available potential peregrine breeding sites in the area. One known site existed several kilometres to the east. Peregrine was seen rarely in the course of other surveys in the wider locality. One sighting was made of a peregrine 1 km north of the proposed development site, flying from the south to the northeast over Tullytresna stalking a flock of golden plover (February 2008).
- Small flocks of whooper swans occurred on Lough Deele (4 km northeast of the proposed development site) in early winter and in late winter – spring. Numbers varied in different occasions and seasons, but the maximum recorded was 18 birds

(April 2006). This would indicate regular occurrence on autumn and spring passage (migration) and smaller numbers occurring in winter.

- Flocks of Greenland white-fronted geese were seen on just one occasion (3rd April 2008), flying NNW. Four flocks were seen in fairly close succession, passing over Meenbog and Tullytresna within a period of one hour, flying a straight trajectory tracked over about 20km (within visible range of optics) from the SSE to NNW. Flight altitude varied somewhat among the flocks, between an estimated 500 to 900 metres over datum. These geese were apparently on northward migration towards Iceland. The flight route was very straight over the distance tracked (approximately 10 km in either direction) and appeared to follow the Sheskin Burn in towards the site area. If this route is extrapolated back towards the source, the geese could have travelled from the L. Erne direction by way of the L. Derg and then L. Mourne landmarks.
- During walk-over surveys, red grouse were put up from plateau areas on Tullytresna, Cronaglack – Crockalough (1 km north and 4 – 5 km north, respectively, of the proposed development site), and the eastern parts of Cark. Red grouse were also noted calling on occasions in April at the first two locations. Red grouse have been recorded on Culliagh in the past 10 years. The data would indicate that Red Grouse are sparsely distributed and rather localised according to habitat, given that heather cover is also sparse in these uplands. Grouse were not detected within the proposed development site.
- Snipe were detected widely across these uplands. Wet bog, seepage and flush zones were the habitats in which most of the recorded snipe were found. The Meenbog area appears to have relatively high numbers of snipe and breeding was confirmed, although the number of territories may have been under-estimated due to some survey visits being conducted outside of the optimum time period for Snipe detection (Gilbert *et al*., 1998).
- Kestrel was seen foraging in the proposed development site and adjacent areas on a frequent basis. Nesting location(s) were not determined but may occur in forestry plantation(s) or wooded areas where old corvid nests are available, possibly within or adjacent to the site. Other amber-listed species (current and former), recorded within or near the proposed development site, included cuckoo, grasshopper warbler, lesser redpoll, skylark, starling, swallow. These species appeared to occur at favourable status in terms of their relative abundance, habitat availability and quality.

<u>Meenbog Wind Farm</u>

Meenbog Wind Farm is located at Cloghan ca. 1.5km south of the proposed Drumnahough Wind Farm. The turbines were erected in 2009.

Bella Terra Environmental Consultants (2008) produced an Environmental Impact Statement for the proposed wind farm at Culliagh Mountain. Pre-construction field survey visits to the site were made in the breeding seasons of 2006, 2007 and 2008. Post construction bird monitoring of the wind farm site took place in 2011 (Natural Environment Ltd, 2011) and 2013 (Natural Environment Ltd, 2014). The most important findings are summarised as follows:

- A total of 12 bird species were recorded within the site during the moorland bird survey, of which six were breeding either within or on the fringes of the site. The birds recorded

comprise mostly common moorland/upland species (e.g. meadow pipit, skylark) as well as those associated with woodland, scrub and conifer forest (Chaffinch *Fringilla coelebs*, willow warbler *Phylloscopus trochilus*, woodpigeon *Columba palumbus* etc). Reed bunting, grasshopper warbler and snipe were not seen, although they have been recorded within the site during previous surveys in 2006-08.

- It was too early to say whether the absence of reed bunting, grasshopper warbler and snipe represent a permanent loss of these species from the site, but the site is of limited extent (50 ha) and the sample size is small. Snipe have been in decline for at least 20 years and it is possible that their absence from the site is due to the overall shrinkage of the breeding population.
- No birds were found during the quarterly corpse searches.

Partridge (2016) produced a bird monitoring report based on monitoring observations at Meenbog Wind Farm in 2015-16. This report covered the third year of bird monitoring. The findings are summarised here:

- There were no 'target' species seen during the VP watches; the only non-passerines recorded being hooded crow and raven.
- A total of sixteen bird species were recorded within the site during the moorland bird survey, of which fourteen were breeding either within or on the fringes of the site. These comprised mostly common moorland/upland species (e.g. meadow pipit - the most numerous species, skylark and wheatear as well as those associated with woodland, scrub and conifer forest (chaffinch, hooded crow, robin, spotted flycatcher, etc). Siskin, goldfinch, lesser redpoll and crossbill, all of which were present in 2011, were not recorded either in 2013 or in 2015. However, wheatear, pied wagtail and snipe, which were absent in 2011, were present. Reed bunting was also noted, although not during the moorland bird survey.
- Numbers of meadow pipit using the site increased during the course of the bird monitoring period 2011-2015, with three territories in 2011, twelve in 2013 and sixteen in 2015.
- Two breeding species, namely grasshopper warbler and snipe, which were recorded during preconstruction surveys, were not been recorded since the wind farm had been built. Snipe have suffered a severe decline in population size in neighbouring Northern Ireland over the past three decades.
- Quarterly searches for bird corpses were carried out around the three turbine bases - in April, July, and October 2015, and in January 2016. However, no bird corpses were found.

Cark Wind Farm

Cark Wind Farm is located adjacent to the eastern boundary of the proposed Drumnahough Wind Farm. During surveys in 2001 (B9 Energy Services, 2001), one key upland bird species, snipe, was confirmed as present on the site. Skylark and meadow pipit were the only other species noted within the proposed extension – both were common. Red grouse were not noted during the visit but the habitat within the extension boundaries appeared suitable and it was considered that the species could be present in the area at very low densities.

7.2.3.3 Wider Study Area

The aim of this section is to demonstrate the relative importance of the broader landscape for birds of higher conservation value in the wider study area through establishing the distribution of certain

species in the surrounding environment. A considerable proportion of lands to the east and south of the proposed development site have been modified for forestry and wind energy purposes. Other areas are used for farming and some have been left comparatively intact e.g. upland blanket bog associated with designated areas.

Following a meeting with NPWS regional staff, it was advised that specific information regarding breeding records/locations from within and surrounding the proposed development site and the Derryveagh and Glendowan Mountains SPA be included, in particular red-throated diver, merlin and curlew. NPWS delivered information for these species on 27th March 2020. This information along with information from other sources is supplied below and illustrated in **Figure 7- 5**. Information on hen harrier and red grouse has also been given below, given their sensitivity to wind energy development. This section also provides information on golden plover and dunlin for which information at the county level has been provided by NPWS.

Red-throated diver

Red-throated divers are the smallest of the divers found in Ireland. There are three diver species recorded from Ireland including red-throated diver, black-throated diver and great northern diver. Of the three species, only the red-throated diver is known to breed in Ireland. Breeding red-throated diver is amber listed because it is a rare breeder and its population has unfavourable conservation status in Europe with the global population concentrated outside of Europe. Red-throated diver is a rare breeding species in Ireland with only six pairs recorded in Ireland, all in Co. Donegal. It is a winter visitor to all Irish coasts.

According to the 2007-2011 Bird Atlas, the breeding distribution of red-throated diver is concentrated in northwest County Donegal. There are no records in the 10-km square or hectad (COO) covering the proposed development site or neighbouring hectads (Balmer *et al.* 2013). Red-throated diver were not recorded during the breeding bird surveys at the site in 2018 and 2019 (see **Appendices D-8** to **D-11**). NPWS records indicate four 10km grid squares occupied by red-throated diver in 2017/2018: B82 (2) B92 (1); CO2 (2) and B81 (1), where numbers in parenthesis are numbers of records. All these sites are in excess of 12km from the proposed development site (see **Figure 7-5**).

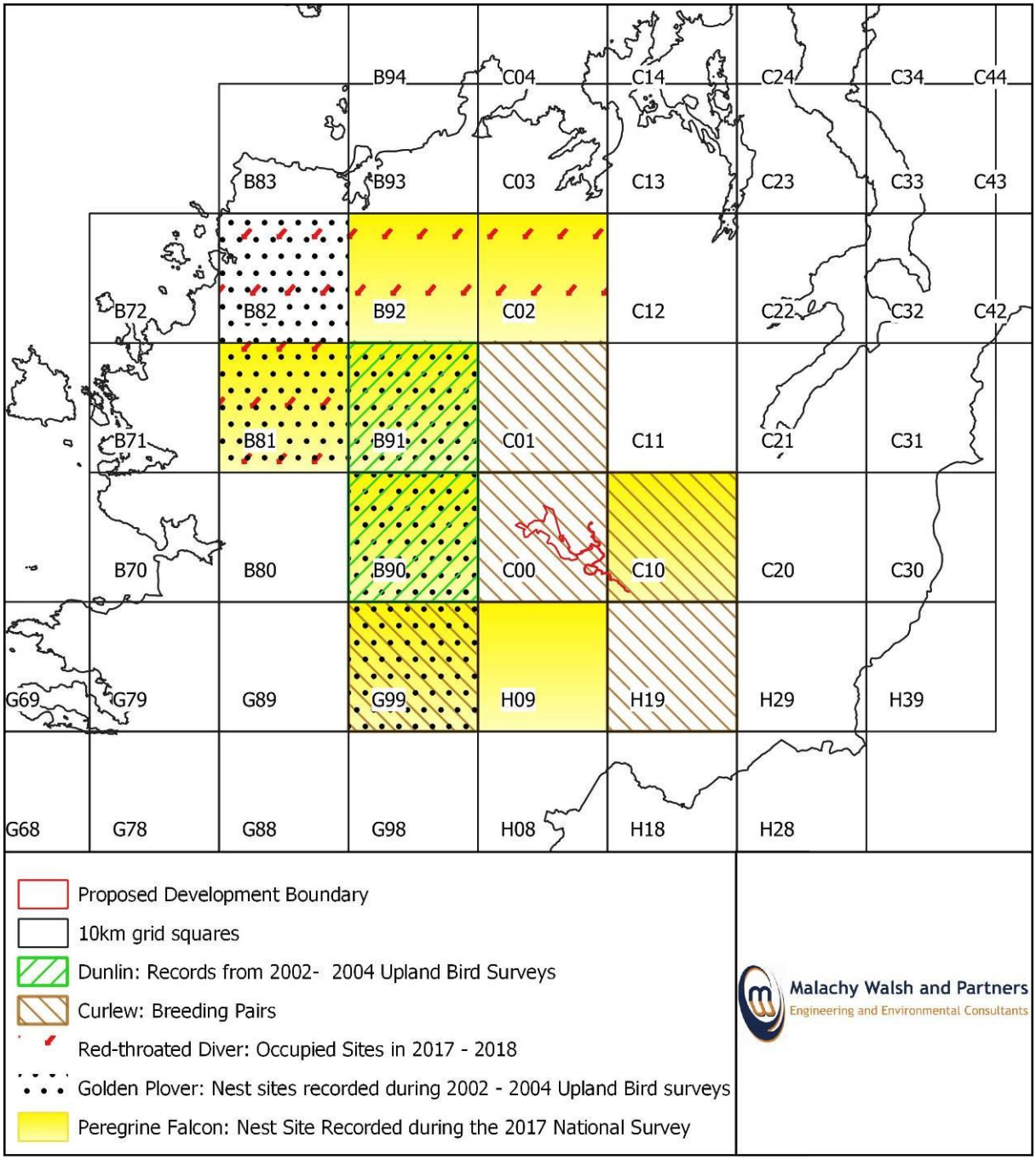

Figure 7- 5 NPWS information on the bird species of conservation interest in the study area[10].

Curlew

The Curlew Conservation Programme (CCP) was established in 2017 to pioneer curlew conservation efforts in Ireland. It is coordinated by the NPWS and involves a wide range of actors, proactively working to help Curlew. The third year of the CCP saw direct efforts in the Donegal area. Survey results for breeding curlew in Donegal are given in the Curlew Conservation Programme Annual Report 2018 (O'Donoghue, 2019). Given the sensitive nature of the species, the locations of the pairs are held by NPWS were not disclosed in this report but hectad locations are provided. Survey results

[10] NPWS datasets are not complete or perfect in terms of quality, so it is important to note that the absence of information in the NPWS dataset for an area does not necessarily imply a low biodiversity value for that area.

for breeding curlew action team (CAT) areas in 2019 are provided in O'Donoghue (2019) and provided in **Table 7-10**.

O'Donoghue (2019) notes that the Donegal curlews (2 fledglings) have clearly not produced enough young chicks (an amalgamated productivity of 0.21 chicks fledged per attempt) since 2017 to maintain a stable population going forward. Donegal continues to be a great concern, given there has been for some years now, a conservation presence by both by both BirdWatch Ireland under INTERREG projects (HELP and CABB), Department of Agriculture, Food & the Marine (GLAS) and NPWS (CCP).

NPWS records indicate five 10km grid squares used by breeding pairs of curlew (see **Figure 7- 5**). At C00, the area encompassing the proposed development site, there was one breeding pair in 2015, 2017 and 2019. These records may correspond with the nest site referred to above. Adjoining 10km grid squares C01 (2017: 2, 2015: 1), C10 (2017: 1, 2015: 1), G99 (2017: 1, 2015:1) and H19 (2019: 1, 2018: 1, 2015: 1) also had breeding curlew where numbers in parenthesis are numbers of pairs in that year.

Table 7- 10 Survey results for breeding curlew in the curlew action team (CAT) area of Donegal in 2018.

Min pairs	Max Pairs*	Min. Pairs Reached Hatching	Min. Pairs Reached Fledging	Min. Number of Fledglings	Min. Breeding Productivity (of confirmed breeding pairs)
4	4	3	1	2	0.5

** some pairs were noted in the course of the breeding season, but it was not confirmed whether they bred.*

Merlin

Merlin have a widespread distribution, low population densities in remote areas and have secretive breeding behaviour making them difficult to survey (Lusby *et al.*, 2017). Analyses by Lusby *et al.* (2011) showed that breeding merlin occupy a wide elevation range and diversity of habitats in upland landscapes and lowland bogs across Ireland. Conifer plantations were a dominant land-use type within merlin breeding territories, second only to peat bogs within 500 m and 2 km of the centre point of breeding territories and were preferentially selected. This may be influenced by the fact that afforestation in Ireland has traditionally focused on peatland habitats (Wilson *et al.* 2012) and therefore is more likely to occur in close proximity to traditionally preferred merlin habitats. Merlin traditionally nested in heather - though their continental counterparts rarely do so - but since the late 1970s merlin have started to nest in trees on edges of conifer plantation, feeding on neighbouring open ground. It is common for merlin to breed within 300m of the previous year's nest and sometimes re-use the same one (Hardey *et al*. 2013). Although breeding merlin selected conifer forests at the nest site scale, their use or avoidance of this habitat for foraging is not known Lusby *et al.* (2011). In Ireland, given the limited availability of suitable heather moorland for ground nesting (peatland areas often too degraded), afforestation may have allowed merlin to exploit nesting opportunities in areas with open suitable foraging habitat but where preferred ground nesting options are limited. However, once suitable nest sites are available, the extent of forest cover may subsequently have a negative effect on merlin, as has been reported for some merlin populations in Britain (Lusby *et al.,* 2011).

In upland areas, they feed on open habitat prey species such as meadow pipit (*Anthus pratensis*) and skylark (*Alauda arvensis*), typically catching them in mid-air during high speed attacks (Birdwatch

Ireland). Merlin territories are traditional and are used repeatedly from year to year by successive generations of birds, though the exact location of the nest does vary. In winter, merlin are more widely distributed and can often be seen at the coast. They are considered short-distant migrants, normally within 100km with smaller numbers moving into France and Iberia in winter months.

Typically, afforestation results in declines of open habitat bird species, while benefitting generalists and forest specialists (Allan *et al*. 1997, Dias *et al*. 2013). For merlin, this relationship is more complex, as afforestation may provide increased opportunities for nesting (Norriss *et al*. 2010, Lusby *et al.* 2011), while simultaneously reducing the availability and suitability of habitats for foraging (Rebecca, 2006). Lusby *et al.* (2011) found that merlin tend to breed in mature conifer plantations and frequently select the tallest trees, leaving them potentially vulnerable to disturbance from forest management operations. Lusby *et al.* (2011) notes the net effect of this shift in nesting behaviour remains unclear, as varying breeding success rates have been recorded for ground nesting compared to tree-nesting merlin populations. The conifer plantation at the 2018-2020 merlin nest site at the Drumnahough wind farm site will likely be abandoned as the conifer reaches thicket stage. This growth will eventually displace the merlin nest site. Felling of forestry of older age in the vicinity of the nest could also result in a change of nest site.

Although Lusby *et al.* (2006) did not detect a relationship between breeding performance and the extent of forest cover within breeding territories, it was deemed likely that where forest cover was more extensive than observed within the territories in the study (e.g. over 35% forest cover with 5 km surrounding nest sites), the suitability for breeding merlin would be reduced. The suitability of the proposed development site and environs to the south and southeast is degraded by the extent of commercial forestry.

Merlin breeding success and productivity varied spatially in the Lusby *et al.* (2016) study. Highest productivity rates were recorded in regions that were also at the highest latitudes (Antrim hills, Inishowen/north Donegal and the Sperrins). Ireland is situated at the southern and western edge of the breeding range of the Eurasian Merlin (Sale, 2015), and the breeding bird atlas (2007– 11) shows a strong bias in distribution of merlin towards the northern half of Ireland (Balmer *et al.* 2013).

The NBDC merlin distribution map[11] was accessed to illustrate the records of merlin (see **Figure 7- 6**). This map shows the distribution of the number of records recorded within each 10km grid square, so is an approximate indicator of merlin numbers in the wider study area. The incidence of merlin in the grid square containing the proposed development site is consistent with records in the county in general.

[11] National Biodiversity Data Centre, Ireland, Merlin (*Falco columbarius*), image, accessed 05 June 2020, https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11701

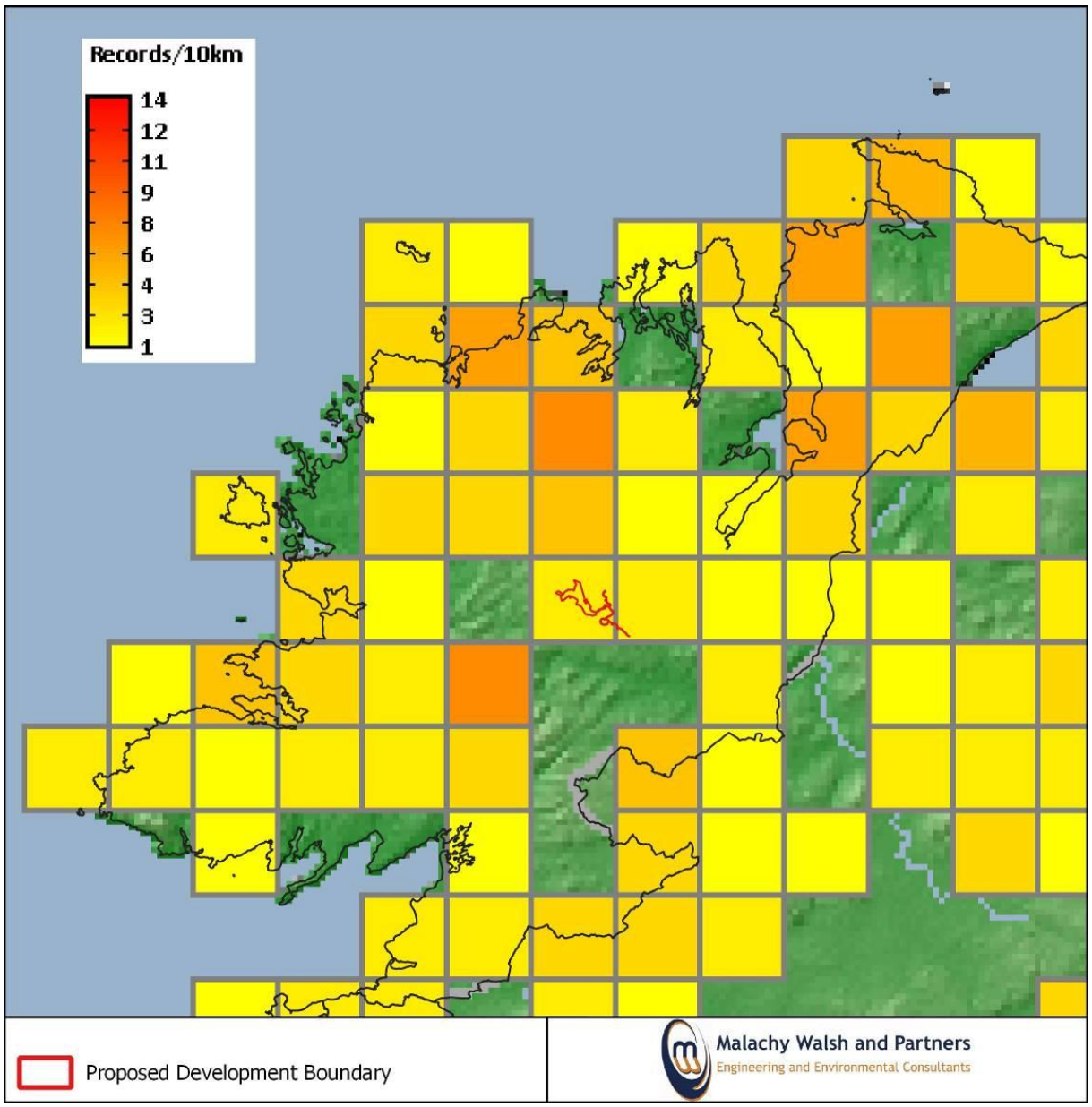

Figure 7- 6 Distribution of the number of merlin records recorded within each 10km grid square

Red grouse

The national red grouse survey 2006-08 (Cummins *et al.,* 2010) found the species strongholds in Co. Wicklow, Co. Laois, Co. Waterford, and along the western seaboard from Co. Donegal to Co. Kerry. This survey is the most recent available for Ireland and has been published by NPWS. For the national 2006-08 red grouse survey, potential grouse squares were assigned to one of five regional categories. The proposed development is located in the northwest border region. Cummins *et al.* (2010) reported that in the northwest border region, there were a scattering of records for the Cuilcagh-Anierin Uplands (SAC 000584) and a record on Boleybrack Mountain (SAC 002032) in County Leitrim and on Slieve Beagh (SAC 004167) in County Monaghan. In Donegal, most sites were occupied (almost two thirds) with birds present in 13 out of 16 sites in Cloghernagore Bog and Glenveagh National Park (SAC 002047). On the Inishowen Peninsula, 11 of the 19 sites surveyed were occupied. On the Glencolumbkille Peninsula, nine out of the 16 sites surveyed had grouse, while further east and south in the county there were records of grouse on Lough Nillan Bog (SAC

000165), Meenaguse Scragh (SAC 001880), Meenaguse/Ardbane Bog (SAC 000172) and Dunragh Lough/Pettigo Plateau (SAC 001125).

All records collected in 10km grid squares between 2006 and 2008 during the survey period are given in Cummins *et al.* (2010), as well as new records for those 10km squares not occupied in the old atlas (1968-1972) are also highlighted. These records are illustrated in **Figure 7- 7**. The stronghold for red grouse is the Cloghernagore Bog and Glenveagh National Park, located over 7km northwest of the proposed development. Red grouse was also recorded in the 10km grid square containing the proposed development, as well as those directly southwest (G99) and east (C10). Grid squares to the northeast (C11), south (B90) and southeast (H19) of the proposed development once had red grouse records, but these date from 1968 – 1972. The results of 2006 and 2008 survey show an overall decline in red grouse distribution in Co. Donegal.

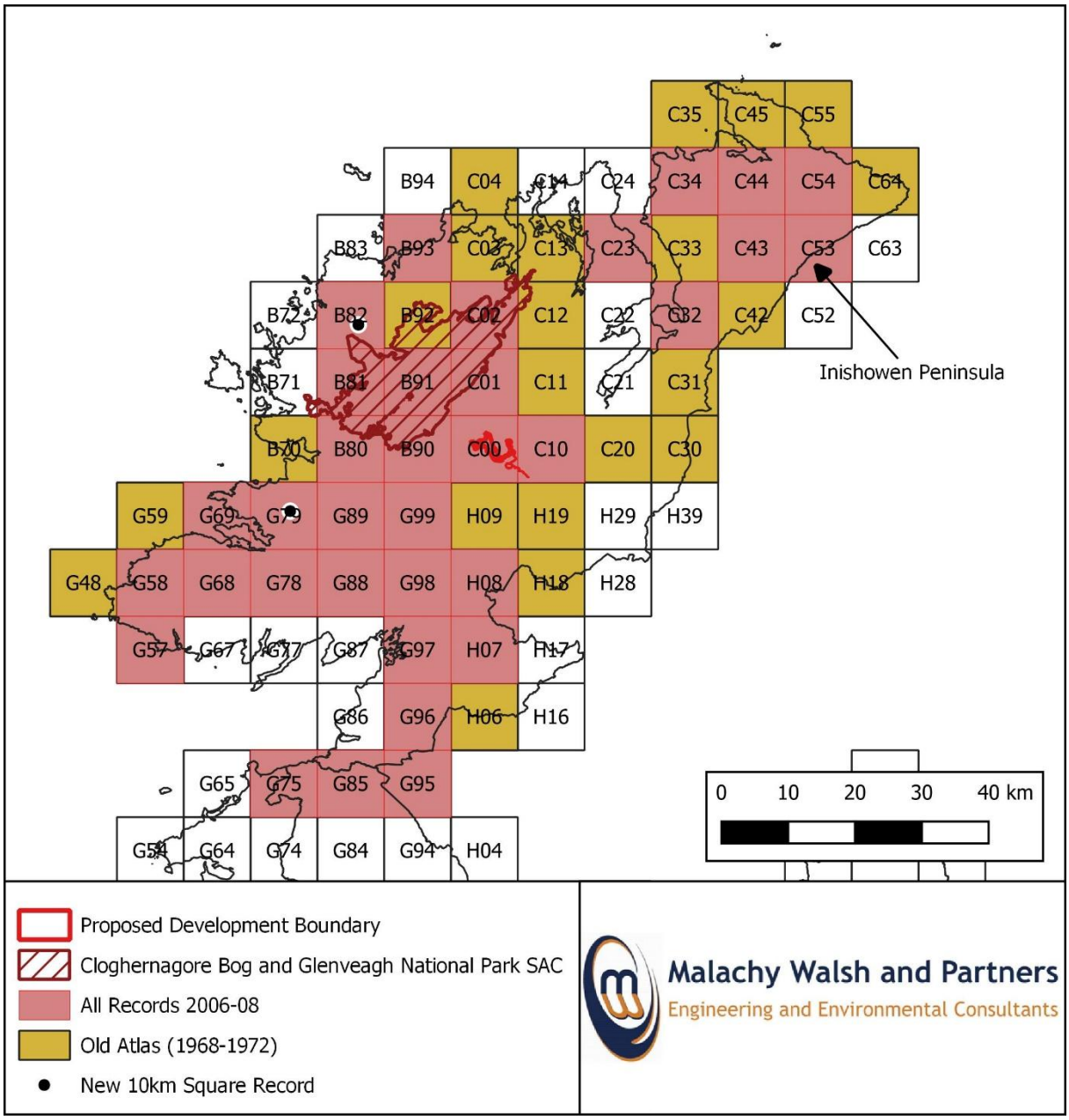

Figure 7- 7 Red grouse records collected in 10km grid squares between 2006 and 2008, with 10km^2 not occupied in the old atlas (1968-1972) also highlighted (adapted from Cummins *et al.*, 2010).

Hen harrier

Six SPAs covering a total land area of c.167,117ha (1,671km²) have been classified for the conservation of this breeding species (Moran & Wilson-Parr, 2015). The proposed development is outside of the stronghold for hen harrier in Ireland. It is located ca. 75km northwest of the nearest SPA designated for hen harrier i.e. Slieve Beagh SPA (4167).

The 2015 national survey of breeding hen harrier in Ireland (Ruddock *et al.*, 2016) gives regional 2015 population estimates of the species utilising 10km grid squares as defined in 1998-2000, 2005 and 2010 for regional mountain ranges or site complexes (See **Table 7- 11**). As indicated in Ruddock *et al.* (2016), the Ruddock *et al.* (2012) study suggested that limited breeding resources may be impacting hen harrier populations in Ireland. The proximate or distal causes of the regional declines include potentially contributing factors such as over-winter survival rates, habitat suitability/change particularly of afforested areas (Wilson *et al.,* 2012), predation, persecution, reduction in food supply, development (e.g. windfarms, O'Donoghue *et al*., 2011) and various disturbance factors e.g. peat cutting, burning etc (Ruddock *et al.,* 2012).

According to Ruddock *et al.* (2016) the Blue Stacks, Pettigo and south Donegal areas in Co. Donegal have largely recorded increases compared with all previous surveys although a small number of losses in 10km squares were recorded and thus movements may account for at least some of the recorded increases in this area. Undoubtedly increased effort in this area in 2010 and again in 2015 has recorded some genuine increases as well as some previously undocumented breeding locations. The distribution of survey squares covered during 2015 and the distribution and numbers of confirmed and possible breeding hen harrier in Ireland during 2015 has been mapped in Ruddock *et al.* (2016) (see **Figure 7- 8**). The 10km grid square covering the proposed development site (C00) was not surveyed during 2015 or during earlier surveys. The nearest surveys were carried out in 10km square H09 and H19 directly south and southeast of C00 respectively. Hen harrier were confirmed from both of these squares, with 2 breeding pairs in H09 (2 confirmed and possible breeding pairs) and 1 breeding pair in H19 (1 possible breeding pair). The location of these areas is presented in **Figure 7- 9**. The findings of the 2015 breeding hen harrier indicate that the Donegal population is stable and increasing. It is noted that most wind energy developments in the region have been in place pre-2015.

Table 7- 11 Regional hen harrier population estimates during 2015 utilising the squares as defined in 1998-2000, 2005 and 2010 for regional mountain ranges or site complexes (adapted from Ruddock *et al.*, 2016).

Region	Total pairs			
	1998 - 2000	2005	2010	2015
Pettigo Plateau & South Donegal	1	3-5	4-5	8-12
Inishowen Peninsula	1-3	0	0	0

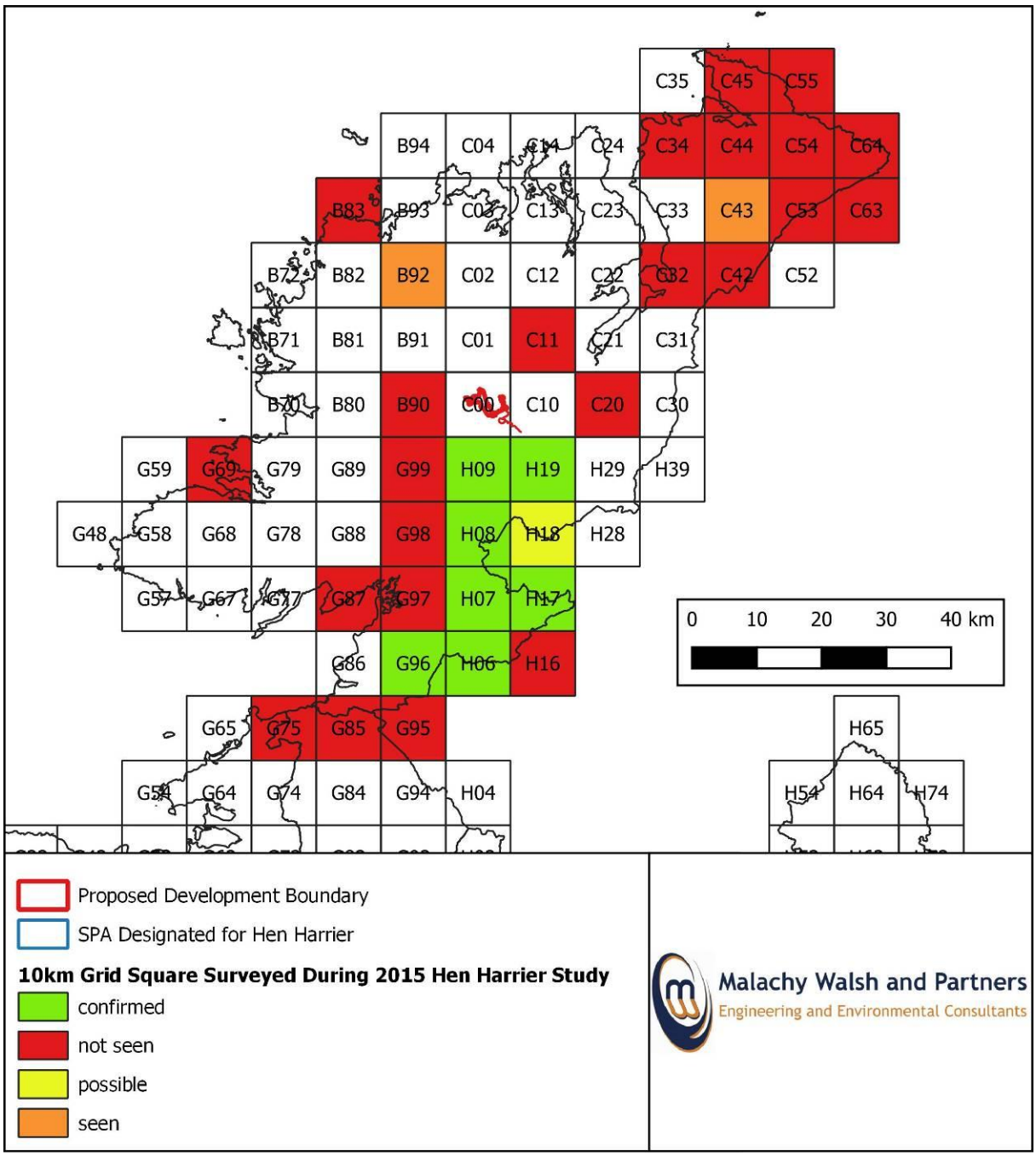

Figure 7- 8 Distribution and numbers of confirmed and possible breeding hen harrier in Ireland during 2015 (based on Ruddock *et al.*, 2016).

Peregrine

Peregrine breed on inland and coastal cliffs. Most inland birds breed on mountain cliffs but will also breed at lower levels. The species is still recovering from a dramatic and well documented decline in the 1950s and 60s due to the effects of pesticide poisoning (Birdwatch Ireland). The population size in Ireland is over 500 pairs. Breeding peregrine are a green listed species and thus of least conservation concern.

In Ireland, most eyries are on cliffs or crags. Peregrines tend to use the largest suitable cliffs available, although the quality of ledges for breeding is important and large cliffs will be ignored if they do not provide adequate ledges. Inland breeding cliffs are often above or overlooking a river or

a loch (Hardey, 2013). Eyries on man-made structures such as power stations, bridges, quarry machinery, churches and electricity pylons are becoming more common (Ratcliffe, 1993).

In the Bird Atlas 2007-11, breeding peregrine did not feature in the hectad covering the proposed development site. Peregrine was only seen rarely during the 2018 and 2019 breeding survey period probably because the site itself lacks potential breeding sites. A single sighting of Peregrine was recorded in July 2019. Peregrine were only rarely sighted during previous bird surveys carried out at the site by Fehily Timoney & Company. Overall, there is very little evidence of peregrine using the proposed development site. The proposed development site lacks potential breeding sites for this species.

Golden Plover

Golden plover breed in heather moors, blanket bogs and acidic grasslands in the uplands of northwest counties and in large numbers in Iceland. This species is largely non-resident, with most birds migrating to Iceland for the breeding season. The main departure from Iceland is late September to early November. During winter, golden plover are regularly found in large, densely-packed flocks and in a variety of habitats both coastal and inland with a widespread distribution. Return movements begin in March and territories become re-occupied mid-April to early May. The breeding population in Ireland is estimated to be around 200 pairs. Substantial breeding declines in Ireland have been attributed to afforestation and to agricultural intensification (EC, 2009).

Golden plover flocks were recorded early in the breeding season in 2018 and were considered birds returning to breeding grounds in Iceland.

Dunlin

Dunlin is a small wader with a small number of birds nesting in Ireland but with very large numbers occurring in winter and on passage in autumn and spring. The southern race *C. a. schinzii* breeds in northern Europe, particularly Iceland and Finland but including Ireland. It winters in Africa (Hutchinson, 1989). A limited number breed on machair habitat along the north and west coast of Ireland. The NPWS in 2011 reported that of the five selected sites where dunlin bred in 2009, two recorded declines in 2011 and three appeared to have lost dunlin as a breeding species in Counties Donegal and Mayo. The reasons for the decline include agricultural intensification and human disturbance.

7.2.4 Species Evaluation

7.2.4.1 Selecting Avian Key Ecological Receptors (KERs)

An evaluation and identification of Avian Key Ecological Receptors (KERs) and rationale for inclusion/exclusion as KERs based on criteria set out in **Section 7.1.6** is presented in **Table 7- 12.** This list is based on the bird species recorded at and in the environs of the proposed development site.

Table 7- 12 Evaluation of ecological receptors and selection criteria, and rationale for inclusion/exclusion as KER.

Species	Conservation Status	Description/Occurrence	NRA (2009) Evaluation	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Merlin	Annex I, EU Birds Directive BoCCI Amber List Wildlife Act SCI of Derryveagh and Glendowan Mountains SPA	Scarce resident in Ireland but County Donegal a stronghold for the species. Estimated 200 pairs breeding (NPWS Article 12. Numbers increase in winter with an influx of Icelandic birds. Occurs within the site and in SPA ca. 5.5km to northwest of site.	County importance Winter & Summer	**Yes**	Conservation Status: Annex I Species. Recorded in breeding atlas hectad Observed flying at the collision risk height during the survey period Nesting within site during 2018 and 2020 and close to/within the site in 2019 SPA to northwest is classified as National/International Importance.
Peregrine	Annex I, EU Birds Directive BoCCI Green List SCI of Derryveagh and Glendowan Mountains SPA Wildlife Act	Not recorded within hectad C00. Estimated National breeding population of peregrine: 425 breeding pairs (National Breeding Peregrine Survey 2017 (IRSG, 2018)).	Local importance (higher value) Winter & Summer	**Yes**	Conservation Status: Annex I Species. Observed flying at the collision risk height during the survey period. Little evidence of peregrine using the proposed development site. Proposed development site lacks potential breeding sites for this species and no optimal breeding habitat present adjacent to site.
Hen harrier	Annex I, EU Birds Directive BoCCI Amber List Wildlife Act	Recorded within hectad C00. Based on a 2010 national survey Ruddock *et al.* (2012) estimated the population to be 128 to 172 breeding pairs Wilson-Parr (2013) estimates a mid-winter population range of 269-349 individuals.	Local importance (higher value) Winter & Summer	**Yes**	Conservation Status: Annex I Species. Recorded in breeding and winter atlas hectad Observed flying at the collision risk height during the survey period. Little evidence using the proposed development site during 2018/2019/2020 surveys but frequently recorded during 2006/2007/2008

Species	Conservation Status	Description/Occurrence	NRA (2009) Evaluation	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Kestrel	BoCCI Amber List Wildlife Act	Recorded within hectad C00. Kestrel is widespread in Ireland and common localised breeder in this region of Donegal with small numbers frequenting this site. Population size/estimate (NPWS Article 12): Min: 12100 Max: 21220	Local importance (higher value) Winter & Summer	**Yes**	Recorded in breeding atlas hectad. The population recorded across the seasons was assigned local importance (higher value) based on a resident/regularly occurring population assessed to be important at the local level. Observed flying at the collision risk height during the survey period.
Sparrowhawk	BoCCI Amber List Wildlife Act	Recorded within hectad C00. The Sparrowhawk is the most common and widespread species of raptor in Ireland Newton, I. (2002). Population size: Min: 9100 Max: 14830	Local importance (higher value) Winter & Summer	**Yes**	Recorded in breeding atlas hectad. Survey results indicate that this species is a regular user of the site. Observed flying at the collision risk height during the survey period. The population recorded across the seasons was assigned local importance (higher value) based on a resident/regularly occurring population assessed to be important at the local level.
Buzzard	BoCCI Green list Wildlife Act	Recorded within hectad C00. This species is largely resident, throughout Ireland, receives birds from Britain during the winter Buzzard breeding numbers and range has been steadily increasing after a historical decline in Ireland (Greenwood *et al*. (2003) NPWS Article 12: population size/estimate: 1500	Local importance (higher value) Winter & Summer	**Yes**	Recorded in breeding atlas hectad. Recorded during all seasonal VP surveys and nesting to the west of the proposed development site. Observed flying at the collision risk height during the survey period. There is a lack of optimal breeding habitat within the confines of the site boundary as the species favours mature stands of broadleaved forest for nesting.

Species	Conservation Status	Description/Occurrence	NRA (2009) Evaluation	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Golden eagle	Annex I, EU Birds Directive BoCCI Red-listed Wildlife Act	Not recorded within hectad C00. Recently re-introduced to Ireland NPWS Article 12: estimated national wintering population is 2, estimated national breeding population is 1 pair	National importance Winter and Summer	**Yes**	Conservation Status: Annex I Species. Not recorded in breeding atlas hectad. Recorded three times during 2018-2020 surveys. Observed flying at the collision risk height during the survey period. There is no evidence to suggest that the proposed development site is an important site for this species. There was no consistent trend in the occurrence of golden eagle at the site, nor is the site within the core foraging range of a known nesting pair.
Golden plover	Annex I, EU Birds Directive BoCCI Red List Wildlife Act SCI of Derryveagh and Glendowan Mountains SPA	Not recorded within hectad C00. NPWS Article 12: estimated National Wintering Population is 99,870, estimated national breeding population is 134-156 pairs	County importance[12] Winter Breeding N/A	**Yes**	Conservation status: Annex I Species. Rare occurrences of flocks of County Importance were recorded during VP watches during the winter survey and early during the summer survey of 2018. The windfarm site is not of foraging significance to the species but the species does pass through the site. Majority of the proposed development area is made up of coniferous plantation, which is not optimal foraging, loafing or roosting habitat for the species. Over the three years of surveys, no migratory routes over the site. No evidence of breeding activity within/near the site
Snipe	BoCCI Amber list Wildlife Act	Recorded within hectad C00. NPWS Article 12: estimated breeding population of 4275	Local importance (higher value) Winter and	**Yes**	Recorded in breeding atlas hectad. Conservation Status. Some display flight activity at collision risk height.

[12] 1% of the ROI National wintering population of Golden Plover is 999. As per NRA 2009, a regularly occurring population of 999 golden plover is required for classification as Nationally Important. The maximum number of golden plover recorded was 40. This maximum number does not correspond with the classification criteria for National or International Importance (Crowe and Holt, 2013). Rare occurrences of flocks of County Importance were recorded during VP watches during the winter survey and early during the summer survey of 2018.

Species	Conservation Status	Description/Occurrence	NRA (2009) Evaluation	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
			Summer		
Goosander	BoCCI Amber list Wildlife Act	Not recorded within hectad C00, but known to frequent large lakes in Donegal. NPWS Article 12: estimated breeding population of 5.	Local importance (higher value) Winter and Summer	**Yes**	Not recorded in breeding atlas hectad. Small Irish population and occurrence, albeit a single observation in the study area. Observed flying at the collision risk height during the survey period.
Great black-backed gull	BoCCI Amber list Wildlife Act	Not recorded within hectad C00. NPWS Article 12: estimated breeding population of 2445	Local importance (higher value) Winter and Summer	**Yes**	Observed flying at the collision risk height during the survey period.
Lesser Black-backed Gull	BoCCI Red List Wildlife Act	Not recorded within hectad C00. NPWS Article 12: estimated Winter population of 10,363; estimated breeding population of 4,239	Local importance (higher value) Winter and Summer	**Yes**	Not recorded in breeding atlas hectad. Recorded once during 2018/19 (within the site) and once during summer 2019 (outside the site). No evidence of breeding or roosting activity was recorded within the study area. Site dominated by conifer plantation. Habitats onsite are not considered suitable for breeding. Therefore, this species cannot be considered to be dependent on the habitats of the site. Numbers of ecological significance as per NRA criteria were not recorded over the site. Observed flying at the collision risk height during the survey period so included as a KER on a precautionary basis.
Grey Heron	BoCCI Green list Wildlife Act	Recorded within hectad C00. NPWS Article 12: estimated population of 3087	Local importance (higher value) Winter and Summer	**Yes**	Numbers of ecological significance as per NRA criteria were not recorded, but the species was recorded flying at the collision risk height during the survey period. Additionally, it is considered a wind farm-sensitive species.
Teal	BoCCI Amber list	Not recorded within hectad C00.	Local importance	**No**	Not recorded in breeding atlas hectad. Numbers of ecological significance as per NRA criteria were

Species	Conservation Status	Description/Occurrence	NRA (2009) Evaluation	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
	Wildlife Act	NPWS Article 12: estimated breeding population of 531 pairs; estimated max. population of 885	(higher value) Winter and Summer		not recorded.
Mallard	BoCCI Green list Wildlife Act	Recorded within hectad C00. NPWS Article 12: estimated national population of 20050	Local importance (higher value) Winter & Summer	**No**	Recorded in breeding atlas hectad. Numbers of ecological significance as per NRA criteria were not recorded, No flight paths within/near the proposed development site
Woodcock	BoCCI Red list	Recorded within hectad C00. No population data available for woodcock in Ireland. A species of wading bird, adapted to breed in woodland.	Local importance (higher value) Winter & Summer	**No**	Confirmed breeding in atlas hectad Conservation status. Potentially breeding in small numbers within site. Lack of sightings during breeding walkover surveys and the overall low numbers recorded throughout the study period indicate that the study area does not support a large population of this species.
Red Grouse	BoCCI Red list Wildlife Act.	In Ireland, it is a widespread breeding bird but nowhere is it numerous. NPWS Article 12 population size/estimate: Min: 1708 Max: 2116 Found on mountains, moorland and lowland blanket bogs and raised bogs. Closely associated with Ling Heather dominated habitats such as upland heath-land, blanket bog and lowland raised bog.	Local importance (higher value) Winter County importance Summer	**Yes**	Conservation status. Recorded in breeding atlas hectad. Some suitable breeding and foraging habitat occurs within, and moreover extending away from the site. Resident population to south of site.
Red-throated diver	SCI of Derryveagh and Glendowan Mountains SPA	Not recorded within hectad C00 NPWS Article 12: estimated breeding population of 6 pairs.	Local importance (higher value) Summer	**No**	Not recorded in breeding atlas hectad. Only one observation of an adult in June 2006 was made at Lough Deele and not recorded during 2018-2020 surveys.

Species	Conservation Status	Description/Occurrence	NRA (2009) Evaluation	KER (Yes/No)	Rational for Inclusion/Exclusion/Criteria
Whooper swan (winter)	Annex I, EU Birds Directive BoCCI Amber List Wildlife Act	Not recorded within hectad C00. NPWS Article 12: estimated national wintering population of Whooper Swan in Ireland is 10,520.	Local importance (higher value) Winter	**No**	Not recorded in breeding atlas hectad. Whooper swan activity (a small flock of 2 adults and 1 juvenile) was recorded at Lough Deele to the east of the site, however no flight paths were recorded to or from Lough Deele. The results of the extensive surveys completed, does not suggest that the proposed development is located on an important migratory route for the species. Numbers of ecological significance as per NRA criteria were not recorded over the site.
Greenland white-fronted goose	Annex I, EU Birds Directive BoCCI Green-list Wildlife Act	Not recorded within hectad C00. NPWS Article 12: estimated breeding population of 12173 in Greenland/Ireland & UK. In 2008, four flocks were seen flying in the same direction and in close succession most likely on north-ward migration between an estimated 500 to 900 m over datum	Local importance (higher value) Winter	**No**	Not recorded in breeding atlas hectad Not recorded during the 2018/19 and 2020 surveys.
Passerines (e.g. meadow pipit, grey wagtail)	BoCCI Red list Wildlife Act		Local importance (higher value) Winter and Summer	**Yes**	Resident population. Significant effects are not anticipated as a result of the proposed development. As described in SNH guidance (2017), it is generally considered that passerine species are not significantly impacted by windfarm developments. Included as they are prey for birds of prey that utilise the site and surrounds. Precautionary Principle

7.2.4.2 Determining the Importance of Avian Key Ecological Receptors

This evaluation follows the guidance set out for the assessment of birds as outlined in Percival (2003). The criteria are outlined in **Section 7.1.6** above.

Species of High Sensitivity

Consideration of the survey data against **Table 7-1** above indicates that two High sensitivity species have been recorded:

- Golden eagle
- Goosander

Species of Medium Sensitivity

Consideration of the survey data against **Table 7-1** above indicates that five species of Medium Sensitivity has been recorded:

- Merlin
- Peregrine
- Golden plover
- Lesser black-backed gull
- Red grouse

Species of Low Sensitivity

Consideration of the survey data against **Table 7-1**, above, indicates that the remaining Avian KERs are classified as Low Sensitivity species. These are:

- Kestrel
- Sparrowhawk
- Buzzard
- Snipe
- Great black-backed gull
- Grey heron
- Passerines, including meadow pipit, and grey wagtail

7.2.5 Do-Nothing Scenario

The proposed development site is situated predominantly within a commercial forestry plantation, across different stages of the rotation cycle. If the proposed development does not proceed, it is likely that current land-use will remain the same.

The potential for birds to use the areas under commercial forestry at the site is directly correlated to Coillte's forestry management of the site. Forestry plantations in their initial years, prior to closed canopy, have potential to support more passerines (e.g. goldcrest, stonechat, finches, tits, songbirds) and therefore breeding and foraging birds of prey (merlin, buzzard, hen harrier, sparrowhawk). Therefore, as forestry matures, there are varying degrees of suitability for birds. With felling and replanting, there is potential for ongoing loss and creation of habitat for birds.

Pre-thicket forestry is considered favourable in terms of foraging habitat for birds of prey. The forestry management plan has been reviewed from year 2020-2060), which would overlap with the

lifetime of the proposed development. It is considered that subject to normal management practices, the forestry plantation occurring will be suitable for nesting merlin between 3-9 years after planting, and forestry will be suitable for foraging merlin between 3-15 years after planting.

7.3 LIKELY SIGNIFICANT EFFECTS

The construction phase impacts associated with the proposed development (including turbine hardstands, roads, borrow pits) and operation of the proposed development are outlined below. The construction impacts relate to habitat loss, disturbance/displacement during construction and barrier effect. The operation impacts relate to disturbance/displacement, barrier effect and bird collisions with moving turbine rotors.

To assess the significance of potential impacts on the avian KERs, an appraisal of the magnitude of impacts on these species is necessary. Percival (2003) details an assessment methodology to determine the significance of an impact based on the product of the sensitivity of the receptor and the magnitude of the effect. The sensitivity of a species is defined by Percival (2003) as its ecological importance and nature conservation interest at the site being assessed. The significance of any one impact is a product of the sensitivity of the receptor, the magnitude of the impact and the probability of that impact occurring. The assessment in the following subsections follows this evaluation methodology as outlined in Percival (2003).

It must be noted that the identification of a risk does not represent a prediction either that it will occur, or that it will create or cause significant impact.

7.3.1 Construction Phase

7.3.1.1 Designated Areas

Two designated sites were identified within the ZOI of the proposed development (see **Table 7- 5**). These were Cloghernagore Bog and Glenveagh National Park pNHA and Tullytresna Bog pNHA. The other designated areas within 15km have been excluded for further assessment as they are not within the ZOI. Cloghernagore Bog and Glenveagh National Park pNHA overlaps with the Derryveagh and Glendowan Mountains SPA. Tullytresna Bog pNHA overlaps with the River Finn SAC where this SAC occurs at the southern boundary of the proposed development site. The NIS concluded that the project will not adversely affect the integrity of these European sites.

<u>Cloghernagore Bog and Glenveagh National Park pNHA</u>

Given the intervening distance of ca. 5.5km and lack of hydrological connection between the proposed development site and the SPA, the proposed development will not negatively affect supporting habitats of the birds of interest in this pNHA. There will be no direct loss of habitat within pNHA and any potential water quality impacts arising from the proposed development will not affect the pNHA, as it is located upslope of the hydrological ZOI of the proposed development. The potential impact of the proposed development at construction stage is assessed as **imperceptible negative.** This is related to potential displacement of red-throated diver which has a core foraging area greater than the distance to the proposed development i.e. (generally <8km).

As there is hydrological connectivity between the proposed development site and the pNHA, potential impacts from the proposed development upon Tullytresna Bog pNHA are possible as a

result of hydrological changes such as water quantities or water quality from pollution or siltation. With regard to the implications of the proposed development on hydrology, identified as imperceptible negative in Chapter 10, it is considered that the proposed development will not have a significant negative effect on birds of conservation interest in the pNHA at the National level.

Tullytresna Bog pNHA

At its closest, this pNHA is located ca. 150m to the south of the proposed development. The bog supports red grouse and snipe, with merlin also reported by NPWS staff. There is potential for some disturbance impacts on these birds in the pNHA, all of which have been included as avian KERs and are discussed below. Hydrological changes related to volume of water could alter the peat habitats of conservation value at Tullytresna Bog pNHA, and cause erosion of riparian areas and therefore affect the birds that use this site. This will be a negative impact of low magnitude as **Chapter 10** identified an insignificant increase in water volumes leaving the proposed development site. The potential impact of the proposed development at construction stage is assessed as **short-term slight negative**, related to disturbance impacts and **short-term imperceptible negative** in terms of water quality.

As such, no likely significant effects on Tullytresna Bog pNHA are predicted in relation to water quality impacts at a national level.

7.3.1.2 Avian KERs

The wind energy development has the potential to result in habitat loss, disturbance and displacement to the avifauna that reside within the ZOI. The avian KERs in the study area along with their sensitivity to development are listed in **Table 7- 13.** A general description of habitat loss, and disturbance and displacement impacts during construction are provided in the following sections. The effect of habitat loss and alteration over lifetime of wind farm is discussed.

The sensitivity of species and magnitude of the effect are combined via cross tablature to yield the construction impact significance of birds selected as avian KERS as listed in **Table 7- 14**.

Table 7- 13 Key ornithological receptor species and sensitivity to development (using criteria in Percival, 2003).

Species & BoCCI status[13]	Preferred habitat	Season of observation	Sensitivity/value of receptor
Merlin	Wide variety of open habitats[14]: lowlands, coastal; uplands, bogs	Winter & Breeding	Medium
Peregrine	Coastal, wetland	Winter & Breeding	Medium
Kestrel	Open habitats	Winter & Breeding	Low
Sparrowhawk	Widespread; wooded areas, gardens, uplands, heaths, bogs	Winter & Breeding	Low
Buzzard	Open land	Winter & Breeding	Low

[13] BoCCI status indicated by colour

[14] Sale (2015)

Species & BoCCI status[13]	Preferred habitat	Season of observation	Sensitivity/value of receptor
Golden eagle	Coastal, upland	Winter & Breeding	High
Hen Harrier	Coastal (winter), upland (breeding)	Winter	High
Golden Plover	Coastal, wetland; upland wetlands	Winter & Breeding	Medium
Snipe	Wetlands, inland lakes	Winter & Breeding	Low
Goosander	Wetlands, inland lakes	Winter & Breeding	High
Great black-backed gull	Off-shore islands and coastal cliffs	Breeding	Low
Lesser Black-backed Gull	Off-shore islands, islands in inland lakes, sand dunes and coastal cliffs	Breeding	Medium
Grey Heron	All wetland types, e.g. coastal, lagoons, rivers, lakes	Winter & Breeding	Low
Red Grouse	Uplands, heaths, bogs	Winter & Breeding	Medium
Passerines (meadow pipit, grey wagtail)	Widespread: wooded areas, gardens, uplands, heaths, bogs	Winter & Breeding	Low

Effect of habitat loss and alteration over lifetime of wind farm

Habitat loss within the development area will be mostly in conifer plantation and to a lesser extent on peatland habitats. Peat habitats utilised by the majority of the high-risk species listed above will be directly impacted or altered to facilitate construction. As indicated in Drewitt and Langston (2006), the scale of direct habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the proposed development but, generally speaking, is likely to be small per turbine base.

The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance can amount effectively to habitat loss Drewitt and Langston (2006). Displacement may occur during both the construction and operational phases of wind farms and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance.

Passerines

The loss of conifer habitat has the potential to impact on passerines, which are frequent within the site. Habitat loss is inevitable when the development of turbine foundations, hardstands, service roads and other associated construction is considered. This can result in reduced feeding and nesting opportunities for birds. However, direct habitat loss by this development will be relatively limited owing to the low degree of felling required for the construction of the turbines and hardstands. Keyhole or limited felling will be required at turbines T2 – T8, T11 and T12. Almost half of internal roads have previously been built for forestry purposes with the exception of a limited number of spur roads and turning areas. Keyhole felling will be applied to minimise the amount of trees to be removed for the development footprint, thereby limiting the habitat loss within the conifer

plantation habitat. There is an abundance of conifer plantation close by and in the overall area. The loss of peat habitats will reduce the available nesting habitat for ground nesting passerines such as meadow pipit and skylark but this is not significant in the context of availability of this habitat elsewhere within the site and surrounding area. Therefore, habitat loss due to felling is considered a **long-term, imperceptible negative impact** on passerines or a *low* impact on passerines (using criteria in Percival, 2003). Furthermore, in areas that will be affected by keyhole felling, a new habitat will be created that will benefit species such as grasshopper warbler, stonechat and wren, and other species that favour more open habitat with plenty of cover in the form of residual brash.

Birds of prey

Merlin, buzzard, sparrowhawk, kestrel, peregrine and golden eagle were recorded within the proposed development site during recent avian monitoring, with hen harrier recorded in 2006-2008 surveys. These birds are known to breed in both conifer and broadleaved woodlands and hunt/forage over a variety of habitats, with merlin having a preference for ground nesting in open habitats. It is considered that the merlin at the proposed development site nested on the ground during the 2018- 2020 seasons. The limited felling of conifer trees to facilitate the development will not significantly impact the species as there is an abundance of similar conifer plantation within the greater area. The felling of conifer trees will not result in significant habitat loss for other bird of prey species recorded in the area. Therefore, habitat loss due to felling is generally considered a **long-term, imperceptible negative impact** on birds of prey or a *low impact* on birds of prey.

Swans, Geese, Ducks, Gulls and Waders

A number of swans, geese, ducks, gulls and waders were observed in the ZOI during surveys. The bogs and wetlands in the study area, as well as Lough Deele (east of proposed development site) offer suitable feeding and breeding habitat for a number of species. Greenland white-fronted geese and whooper swan have been recorded in the study area, but only rarely, and mainly during migratory flights.

As described above, the habitat loss associated with the proposed development will be mainly to isolated areas of conifer and also open peatland habitats. Overall, the limited habitat loss associated with the proposed development site will not significantly impact wetland species as there is an abundance of similar habitat in the general area. Therefore, habitat loss is considered a **long-term imperceptible negative impact** on swans, geese, ducks, gulls and waders or a *low impact* on swans, geese, ducks, gulls, and snipe using Percival (2003) criteria.

<u>Disturbance/Displacement</u>

Another potential impact during construction is disturbance of nesting or wintering birds by human activity, construction activity and the operation of machinery. For the 12 No. turbines, it is estimated that the total proposed development duration will be of the order of 14 months. The active construction area for the collector circuit cable route will generally be confined to a 100-200m stretch of roadway at any one time. The works for the cable route are estimated to take approximately 6 months Grid connection to the permitted Lenalea substation and 3 months for the alternative option. It is likely that both the turbine installation and grid connection works will take place simultaneously. Work taking place during the summer months could cause disturbance to breeding birds and could lead to temporary displacement of some birds from the site and close surrounds during construction.

Evidence from a Pearce-Higgins (2012) study suggests that some bird species are more susceptible to disturbance during the construction phase than during the operational phase. In summary, it was found that red grouse density recovered in the first year after construction following a significant decrease in the construction phase, that curlew and snipe densities declined during construction and did not recover during the first year of operation (whether they recover following this remains unclear), and that stonechat and skylark numbers increased during construction and remained higher during the early stages of operation. The study also showed a 53% decline of snipe within wind farm sites, which is reasonably consistent with an earlier study by Pearce-Higgins that identified a 48% decline in abundance in the species within 500 metres of turbines. The authors state that declines during construction are associated with direct disturbance and (non-significant) increases in numbers have been noted at reference sites which may indicate these birds move into the wider areas to breed as opposed to being lost to the population. However, there is no clear evidence to support this assertion at present[15].

Birds of Prey

With the exception of merlin, which has been recorded inside the boundary of the site, potential disturbance to birds of prey owing to the construction phase is considered a **temporary imperceptible negative impact** or a *low impact* using Percival (2003) methods. The impact on merlin is assessed as **short-term moderate negative** or a *medium impact* using Percival (2003) methods**.** In general there is a suitable breeding and foraging habitat in the surrounding forestry, woodland, wetlands and rough pastures outside the development area for the birds of prey listed recorded at the site.

Swans, geese, ducks, gulls, snipe and waders

The most recent monitoring data show that, with the exception of whooper swan, these species have not been recorded, or occur in low numbers within the site boundary and they do not regularly utilise the site. Most of the flight paths recorded for swans, geese, ducks, gulls and waders during monitoring have been outside the development area (Refer to **Appendices D-8** to **D-11**). For example, Greenland white-fronted geese were recorded during migration. The locations associated with the species that do forage and roost occur largely outside the development area, in the surrounding bog and wetland habitats such as Lough Deele to the east.

[15] http://www.bsg-ecology.com/wp-content/uploads/2015/03/Pearce-Higgins-et-al-2012.pdf

Table 7- 14 Construction impact characterisation for avian KERs based on Percival (2003) and EPA (2017).

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
Merlin	Direct Habitat Loss	This species utilises habitat within the site boundary for roosting, breeding and hunting. The development footprint is dominated by conifer plantation (semi-mature/mature) consequently; direct loss of potential foraging habitat will be minimal. The loss of nesting (on ground) and foraging habitat will be minimal with respect to the substantial areas of undisturbed suitable habitat that will remain.	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of effect is assessed as Low. **Medium** sensitivity species + **Low** Impact = **minor** effect significance. No likely significant effects at a local or county level are predicted.
	Displacement and barrier effect	Disturbance during construction is likely to discourage nesting and foraging in the vicinity of the proposed development. Ruddock & Whitfield (2007) note that merlins are particularly prone to desertion just prior to egg laying and the risk declines thereafter, although individuals were occasionally found breeding at a different site if disturbance occurred prior to or at the laying of the first egg. Ruddock & Whitfield (2007) revealed a very wide range of opinions on the typical distance at which nesting merlins may be disturbed by an approaching human with, for	**Short-term moderate Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local or county level are predicted.

[16] BoCCI status indicated by colour
[17] Significance of potential impact based on EPA (2017)
[18] Magnitude and Significance of potential impact based on Percival (2003)

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
		example, static disturbance during incubation ranging from <10 m to 300 – 500 m, the median 'static' disturbance distance given as 225m. It is possible, though cannot be confirmed, that this wide range represented differences in experiences with ground- and tree-nesting birds, with tree nesting birds likely to detect disturbance at greater distance. Median 'flight initiation distance' or 'active' disturbance distance during chick rearing is given as 310m and 225m respectively by the same authors.			
Peregrine	Direct Habitat Loss	The site is little used by this species and was not observed breeding within the site.	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	The results of surveys indicate that this species does not regularly commute, or forage over the site. The breeding territories for this species are located over 2km away from the proposed	**Short-term Slight Negative**	Once. Reversible, as noise and disturbance levels reduce post	The magnitude of displacement and barrier effects as a result of the proposed development is considered **Low**.

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
		development. As described in Ruddock and Whitfield (2007)[19] disturbance distances for this species range from between 500m-750m. Furthermore, a literature review suggests that nesting peregrines are more susceptible to disturbance impacts from above their nests.		construction	**Medium** sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Kestrel and sparrowhawk	Direct Habitat Loss	The proposed development site is dominated by commercial forestry plantation which does not provide optimal habitat for the species. Direct loss of breeding and foraging habitat will be low	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of the effect is assessed as **Low** for these adaptable species. **Low** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	Disturbance during construction is unlikely to discourage flight activity, foraging or breeding attempts in the vicinity of the proposed development. Previous analyses for raptors have generally found only low levels of turbine avoidance (Hötker *et al*. 2006; Madders & Whitfield 2006), with some species, such as kestrels, known to continue foraging activity close to turbines (Pearce Higgins *et.al* 2009). Significant displacement effects are not	**Short-term Slight Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of the effect is assessed as negligible. **Low** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

[19] M. Ruddock & D.P. Whitfield (2007) A Review of Disturbance Distances in Selected Bird Species. Scottish Natural Heritage.

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
		anticipated.			
Buzzard	Direct Habitat Loss	The proposed development site is dominated by commercial plantation which does not provide optimal habitat for the species. Substantial areas of undisturbed suitable foraging habitat will remain.	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of the effect is assessed as **Low**. **Low** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	Disturbance during construction is unlikely to discourage flight activity, foraging or breeding attempts in the vicinity of the proposed development. There are extensive areas of suitable habitat in the wider area, outside any potential displacement buffer, should any potential displacement effect occur. Significant displacement effects are not anticipated.	**Short-term Slight Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of the effect is assessed as **negligible**. **Low** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Golden eagle	Direct Habitat Loss	Seldom recorded at the proposed development site. The site is dominated by commercial plantation which does not provide optimal habitat for the species. Substantial areas of undisturbed suitable foraging habitat will remain.	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of the effect is assessed as **Low**. **High** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a National level are predicted.
	Displacement and barrier effect	Disturbance during construction is unlikely to discourage flight activity, foraging or breeding attempts in the vicinity of the proposed development.	**Short-term Slight Negative**	Once. Reversible, as noise and disturbance levels reduce post	The magnitude of the effect is assessed as **negligible**. **Low** sensitivity species + **negligible** Impact = **Negligible** effect

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
		There are extensive areas of suitable habitat in the wider area, outside any potential displacement buffer, should any potential displacement effect occur. Significant displacement effects are not anticipated.		construction	significance. No likely significant effects at a National level are predicted
Hen harrier	Direct Habitat Loss	Slight loss of foraging habitat during the construction phase to accommodate wind farm infrastructure, however the area of suitable hen harrier habitat is not considered significant, in the context of the overall site.	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of effect is assessed as **Low**. **High** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	Sightings were infrequent during the 2018/2019/2020 seasons but were seen consistently throughout the survey years 2006/2007/2008. Bright et al. (2006) suggests that displacement can occur up to 500m around construction sites, and Forrest *et al.* (2011) noted a successful breeding pair of hen harrier within 110m of construction activities, where exclusion zones were installed to decrease levels of disturbance.	**Short-term Slight Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	Taking account of the low incidence of this species at the proposed development site and the tolerance of the species, the magnitude is assessed as **Low**. **High s**ensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Golden Plover	Direct Habitat Loss	The development footprint is dominated by conifer plantation, which does not provide suitable habitat for the species. Significant effects with regard to direct habitat loss are not anticipated	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for	Taking account of the low incidence of this species at the proposed development site and lack of foraging habitat, the magnitude is assessed as **Low**.

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
				peatland habitats	**Medium** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a county level are predicted.
	Displacement and barrier effect	Disturbance during construction could discourage flight activity and/or potential foraging in the vicinity of the proposed development. Pearce - Higgins *et al*. (2012) indicated that during the construction phase, golden plover showed no change, or less certain reactions compared with other species.	**Short-term Moderate Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a county level are predicted.
Snipe	Direct Habitat Loss	The development footprint is dominated by conifer plantation, which does not provide suitable habitat for the species. A small proportion of the site comprises suitable habitat but significant effects with regard to direct habitat loss are not anticipated.	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of effect is assessed as **Low**. **Low** sensitivity species + **Low** Impact = **Very Low** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	Some displacement may occur. Pierce-Higgins *et al* (2012) note that snipe densities declined to the order of ca. 50% within 500 metres of turbines at wind farms during construction. However, given the extent of suitable habitat in the wider area, significant geographical scale displacement during the construction phase is not anticipated.	**Short-term Moderate Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **High**. **Low** sensitivity species + **High** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Goosander	Direct Habitat	There is no suitable foraging habitat within the	**Short-term**	Once.	The magnitude of effect is assessed

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
	Loss	proposed development site.	**Imperceptible Negative**	Reversible in the case of conifer plantation, irreversible for peatland habitats	as **Negligible**. **High** sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	Taking account of a single observation during surveys, the displacement and barrier impacts on this species are minimal.	**Short-term Imperceptible Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Negligible**. **High** sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Great black-backed gull	Direct Habitat Loss	No breeding habitat at the proposed development. The loss of foraging habitat for this species will be low, with sufficient suitable habitat plentiful in wider area. Disturbance during construction phase is unlikely to discourage flight activity over the site, in the vicinity of the proposed development particularly given the low levels of activity recorded.	**Short-term Imperceptible Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	During the construction phase of the wind farm significant displacement and barrier effects are not expected, mainly due to the low levels of activity recorded. Post construction, extensive suitable foraging and breeding habitat will remain, as there is an abundance of suitable habitat extending away from the site.	**Short-term Imperceptible Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Low**. **Low** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Lesser Black-backed Gull	Direct Habitat Loss	No breeding habitat at the proposed development. The loss of foraging habitat for this	**Short-term Slight Negative**	Once. Reversible in the	The magnitude of effect is assessed as **Negligible**.

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
		species will be minimal, with sufficient suitable habitat plentiful in wider area. Disturbance during construction phase is unlikely to discourage flight activity over the site, in the vicinity of the proposed development particularly given the low levels of activity recorded, and the existing levels of activity present at the site.		case of conifer plantation, irreversible for peatland habitats	**Medium** sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	During the construction phase of the wind farm significant displacement and barrier effects are not expected, mainly due to the low levels of activity recorded. Post construction, extensive suitable foraging and breeding habitat will remain, as there is an abundance of suitable habitat extending away from the site.	**Long-term Imperceptible Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Negligible**. **Medium** sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Grey Heron	Direct Habitat Loss	There will be minimal works at habitats potentially used by foraging Heron. The site is of no particular value to this species.	**Short-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of the effect is assessed as **Low**. **Medium** sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	This species is expected to select higher value foraging and breeding habitats available in the wider geographical area rather than any of the habitat types within the footprint of the proposal.	**Short-term Slight Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of displacement and barrier effects as a result of the proposed development (construction and construction phase) is considered **Low - Negligible**.

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
					Medium sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Red Grouse	Direct Habitat Loss	The development footprint is dominated by conifer plantation, which does not provide suitable habitat for the species. A small proportion of the site comprises suitable habitat but significant effects with regard to direct habitat loss are not anticipated.	**Long-term Moderate Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of effect is assessed as **Low**. **Medium** sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	Disturbance during construction is unlikely to discourage foraging or breeding attempts as the areas of suitable habitats are largely located outside the proposed development footprint and buffered from windfarm infrastructure by Sitka plantation. Pierce-Higgins *et al* (2012) note that red grouse densities declined on wind farms during construction. The occurrence of red grouse near wind energy access routes in a Scottish case study was found to be higher than in the surrounding moor (Pearce Higgins *et al*. 2009). Additionally, populations of red grouse were found to recover within one year after disturbance caused by construction of wind farms (Pearce-Higgins *et al*. 2012). The construction on the open peatlands may displace red grouse but significant displacement	**Short-term Moderate Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Medium**. **Medium** sensitivity species + **Medium** Impact = **Major** effect significance. No likely significant effects at a local level are predicted.

KER & BoCCI status[16]	Potential impacts		Duration and Magnitude of potential impact[17]	Frequency and reversibility	Magnitude and Significance of effect[18]
		effects are not anticipated.			
Passerines (meadow pipit, grey wagtail)	Direct Habitat Loss	Loss of bogland and conifer plantation will reduce available nesting and foraging habitat. However, impacts are not considered significant given the availability of similar and suitable breeding and foraging habitat within and surrounding the site	**Long-term Slight Negative**	Once. Reversible in the case of conifer plantation, irreversible for peatland habitats	The magnitude of effect is assessed as **Medium**. **Medium** sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Displacement and barrier effect	The construction phase of the proposed development may temporarily result in some disturbance, or displacement for passerines. Existing activities at the site include forestry operations, including felling, and thinning of forestry. Overall, disturbance during construction phase of the proposed development is unlikely to discourage flight activity, foraging or breeding in the proximity of the site.	**Long-term Imperceptible Negative**	Once. Reversible, as noise and disturbance levels reduce post construction	The magnitude of effect is assessed as **Low.** **Medium** sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

7.3.2 Operational Phase

7.3.2.1 Impacts to Designated Areas

Two designated sites were identified within the ZOI of the proposed development (see **Table 7-5**). These were Cloghernagore Bog and Glenveagh National Park SAC and pNHA and Tullytresna Bog pNHA. The other designated areas within 15km have been excluded for further assessment as they are not within the ZOI or have been assessed in the NIS. The NIS concluded that the integrity of the SPAs will not be adversely affected in view of the sites' conservation objectives. Cloghernagore Bog and Glenveagh National Park pNHA overlaps with the SAC of the same name and the Derryveagh and Glendowan Mountains SPA. Tullytresna Bog pNHA overlaps with the River Finn SAC where this SAC occurs at the southern boundary of the proposed development site.

Cloghernagore Bog and Glenveagh National Park pNHA

Given the intervening distance and lack of hydrological connection between the proposed development site and the SPA, the proposed development will not negatively affect birds of interest in this pNHA in terms of barrier effect and collisions. It is considered that the proposed development will not have a significant negative effect on the birds of conservation interest in the pNHA. The potential impact of the proposed development at operational stage is assessed as **none**.

Tullytresna Bog pNHA

At its closest, this pNHA is located ca. 150m to the south of the proposed development. The bog supports red grouse and snipe, with merlin also reported by NPWS staff. There is potential for some impacts in terms of barrier effect and collisions birds in the pNHA, all of which have been included as avian KERs and are discussed below. The potential impact arising from the development is assessed as **medium term imperceptible negative** on birds of conservation interest in this designated site.

7.3.2.2 Avian KERs

A collision risk analysis has been undertaken to inform this assessment and full details are provided in **EIAR Volume 3 Appendix D-12**.

The sensitivity of species and magnitude of the effect are combined via cross tablature to yield the operational impact significance for birds selected as avia KERS as in **Table 7- 17.**

The main operational effects of a wind farm are displacement due to barrier effects and collision (disturbance outlined in previous section). These effects are outlined in Drewitt and Langston (2006) and are summarised hereunder.

Barrier effect

The effect of birds altering their migration flyways or local flight paths to avoid a wind farm is also a form of displacement. This effect is of concern because of the possibility of increased energy expenditure when birds have to fly further, as a result of avoiding a large array of turbines, and the potential disruption of linkages between distant feeding, roosting, moulting and breeding areas otherwise unaffected by the wind farm. The effect depends on species, type of bird movement, flight height, distance to turbines, the layout and operational status of turbines, time of day and wind force and direction, and can be highly variable, ranging from a slight 'check' in flight direction,

height or speed, through to significant diversions which may reduce the numbers of birds using areas beyond the wind farm.

Collisions

Collision risk depends on a range of factors related to bird species, numbers and behaviour, weather conditions and topography and the nature of the wind farm itself, including the use of lighting. Clearly, the risk is likely to be greater on or near areas regularly used by large numbers of feeding or roosting birds, or on migratory flyways or local flight paths, especially where these are intercepted by the turbines. Large birds with poor manoeuvrability (such as raptors, swans and geese) are generally at greater risk of collision with structures (Brown *et al*. 1992) and species that habitually fly at dawn and dusk or at night are perhaps less likely to detect and avoid turbines (Larsen and Clausen, 2002). Collision risk may also vary for a particular species, depending on age, behaviour and stage of annual cycle. The loss of small numbers of individual birds as predicted is not predicted to have a significant effect on local bird populations. Any impacts are reversible as the overall population is deemed sufficiently robust to recover in terms of numbers and distribution within a relatively short space of time.

Table 7-15 presents the final collision risk modelling results for each species. The full Collision Risk Assessment is given in the Appendices. **Table 7-16** gives the operation impact characterisation for avian KERs.

Table 7- 15 Mean number of predicted collisions per year and per 30 years, using 24 months of data and the application of avoidance rates specified by SNH.

Species	Mean no. of predicted collisions per year	Mean no. of predicted collisions per 30 years
Buzzard	0.347	10.41
Golden eagle	0.0165	0.495
Golden plover	0.087	2.61
Goosander	0.009	0.27
Great black-backed gull	0.023	0.69
Grey heron	0.008	0.24
Hen harrier	0.002	0.06
Kestrel	0.158	4.74
Lesser black-backed gull	0.0635	1.905
Merlin	0.0014	0.042
Peregrine	0.0003	0.009
Sparrowhawk	0.0007	0.021

Studies at upland sites in the UK have generally reported very low collision rates, with some studies finding no collisions at all Percival (2003). This probably reflects the generally low bird densities present in these areas, though it should be noted that to date little work has been undertaken at upland wind farm sites that would pose a significant risk to larger raptor species such as golden eagle or hen harrier, so possible impacts on species such as these are not yet well understood in these locations (Percival, 2003).

According to Percival (2003), it is clear that bird collisions with wind turbines can be a problem under some circumstances, and that it would seem from the evidence available from existing wind farms that there are two main types of sites that have had collision problems:

1. Sites with large raptors occurring regularly within the wind farm at the same height as the rotor blades. In Ireland the main species that would fall into this category would be golden eagle and hen harrier; and
2. Sites with very high densities of other birds flying at rotor height. In Ireland these could include seabird breeding colonies and feeding concentrations, wetlands (including coastal sites) with large waterfowl concentrations and on any major migration routes.

With regard to point 2, the proposed development is not considered to represent a significant effect, as the core wind farm site is not a flyway for large numbers of migratory birds, or birds in transit between roost and foraging locations.

With regard to point 1 above, hen harrier is not considered a significant concern. This species was recorded within the potential collision height for only 3 minutes over the 2-year survey period, which involved surveying for 525,960 seconds. The only species of potential significant concern is golden eagle. This species was recorded for ca. 17.7 minutes within the potential collision height over the same survey period. The number of golden eagle collisions predicted with the proposed turbines, with the application of 99% avoidance rates as specified by SNH (2018) is 0.495 over a 30-year period. This predicted collision rate is based on 85% operation time - a modern wind turbine produces electricity 70-85% of the time (source: website of Irish Wind Energy Association). The CRM predicted a golden eagle collision rate of 0.165 per year using a collision probability of 7.1 (as returned by Stage 2 of the CRM model) and 99% avoidance rate. An alternative interpretation is that the proposed development would have to be in operation for over 60 years (60.6 yrs) to result in one golden eagle collision. Given that this collision (if it occurred) could happen any time within the 60 years, and that the proposed development will operate for 30 years, it is therefore possible that no golden eagle collisions will actually occur. Statistically, during the lifetime of the proposed wind farm, and based on the model used, there is a slightly greater chance of a single golden collision not occurring than of this event occurring.

Percival (2003) notes that golden eagle, which has a high adult survival rate and a low breeding rate may be more susceptible to population impacts, as they would be less able to replace any losses. Percival (2003) recommended that the magnitude of the predicted collision rate should be determined in the context of the background mortality rates. A 'negligible' magnitude impact would, for example, be predicted if the collision mortality was to represent an increase of less than 1% on the background mortality rate (Percival, 2003).

Golden eagle has an adult survival rate of 0.95, a typical lifespan of 23 years and breeds typically at 4 years[20]. Based on the national population of 10 golden eagles and an adult mortality rate of 0.05 (1 - 0.95), the predicted background deaths annually is 0.5, or 1 bird every 2 years. Using 22 golden eagle transits (predicted across the entire proposed wind farm site per year), there is a 3% increase predicted in the species background mortality rate. A 3% increase in annually mortality is not considered significant given the low background annual mortality of 0.05 upon which it is based (influenced by the longevity of the species).

Percival (2003) states that in many cases, it may be that the politically acceptable number of collisions is considerably lower than that at which significant biological impacts would occur on the population. In the case of the current proposal, the esteem of the golden eagle, an iconic and-reintroduced species is likely to influence opinions on levels of significance. The operation impact characterisations given in **Table 7-16** are based on observed evidence and standard methodology for

[20] https://app.bto.org/birdfacts/results/bob2960.htm.

assessing impacts on birds, and to this end are considered realistic. It is important to note that there have been no reported golden eagle collisions with turbines operating at wind farm sites in the Republic of Ireland. A significant proportion of fatalities of raptors have been associated with persecution as outlined in NPWS (2013). The proposed wind farm site and environs are not regarded as sensitive with respect to raptors, including golden eagle taking into account with regard to the core proposed development site:

- survey result of ca. 2.5 years of monitoring (raptors were recorded but the only breeding species within the site was merlin, which does not appear to be affected by existing turbines and nearby ongoing human activities);
- bird sensitivity mapping – no raptors identified as sensitive;
- high avoidance rates of raptors

It is important to note that CRMs are potentially useful, albeit crude, tools in predicting the potential avian collision mortality rates which rotating turbine blades at operational wind farms may incur (Whitfield, 2009), and should not be 'overinterpreted' (Madders & Whitfield 2006). This is not only because of the difficulties surrounding avoidance rates and the metrics necessary for their derivation, but also because the fundamental assumption of CRMs, that collision mortality increases with flight activity, is not necessarily borne out by empirical data. At a crude level, at the logic of this assumption, it is difficult to fault in that, all else being equal, a wind farm with very high bird activity seems bound to lead to more collisions than a wind farm with very low bird activity. This logic seems not to hold, however, at the levels of bird activity documented by most post-construction studies. This may be because at least to date, whether by design or accident, construction of wind farms in areas of high bird activity is exceptional (or research and/or publication of monitoring studies at these sites are exceptional) and restricted to 'problem sites' (Percival, 2003).

Table 7- 16 Operation impact characterisation for avian KERs based on Percival (2003) and EPA (2017)[21].

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
Merlin	Displacement and barrier effect	Disturbance from operation is unlikely to discourage breeding attempts and the species is expected to habituate to the operation of the proposed wind farm development. While monitoring bird activity during the 2018, 2019 and 2020 (to date) breeding seasons, human presence for at least 6 hours/month has apparently not affected breeding or nesting[25].	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low**. **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. This species does not appear to be displaced by wind farm development. No likely significant effects at a local level are predicted.
	Collision	The species was recorded flying with the potential collision risk zone during VP surveys. Opening up forestry through keyholing can create more suitable foraging and nesting habitat close to turbines. As noted in SNH (2016b), this may attract these birds into the wind farm site and increase the risk of collision mortality. The collisions predicted during breeding season per year and per thirty years is 0.0014 and 0.042 respectively. The predicted collision risk is insignificant in the context of the county, national and international population. Given the hunting habit of the species (low flying nature) and height of turbines over ground (33 m), significant	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low.** **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

[21] Population estimates from Ireland's bird species' status and trends for the period 2008-2012 in Article 12 reporting.
[22] BoCCI status indicated by colour
[23] Significance of potential impact based on EPA (2017)
[24] Magnitude and Significance of potential impact based on Percival (2003)
[25] Maintenance crews intermittently service two existing turbines within 400m of the merlin nest site. Nest watches were also carried out so adds to 6hrs/month.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		collision effects are not anticipated. No significant effects are anticipated regarding collision risk at any geographical scale.			
Peregrine	Displacement and barrier effect	The results of surveys indicate that this species does not regularly commute, or forage over the site. The site is little used by this species and was not observed breeding within the site. The breeding territories for this species are located over 2km away from the project. As described in Ruddock and Whitfield (2007)[26] disturbance distances for this species range from between 500m-750m.	**Short-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of displacement and barrier effects as a result of the proposed development is considered **Low**. **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	The species was recorded flying with the potential collision risk zone during VP surveys. Opening up forestry through keyholing can create more suitable foraging and nesting habitat close to turbines. As noted in SNH (2016b), this may attract these birds into the wind farm site and increase the risk of collision mortality. The number of collisions predicted during the breeding season per year and per thirty years was 0.0003and 0.009 number of birds, respectively. In the context of the reported 5151 pairs at the national level, no significant effects are anticipated regarding collision risk at any geographical scale.	**None / Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low** (very slight change from baseline situation). **Medium** Sensitivity + **Low** Impact = **Minor** effect. No likely significant effects at a local level are predicted.
Kestrel and	Displacement	The development footprint is dominated by conifer	**Long-term**	Negligible	The magnitude of the effect is

[26] M. Ruddock & D.P. Whitfield (2007) A Review of Disturbance Distances in Selected Bird Species. Scottish Natural Heritage.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
sparrowhawk	and barrier effect	plantation, which does not provide optimal habitat for this species. Significant displacement effects are not anticipated.	**Imperceptible Negative**	frequency. Reversible.	assessed as low. **Low** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	These species were recorded flying within the potential collision risk zone during VP surveys. Opening up forestry through keyholing can create more suitable foraging and nesting habitat close to turbines. As noted in SNH (2016b), this may attract these birds into the wind farm site and increase the risk of collision mortality. The number of kestrel collisions predicted during the breeding season per year and per thirty years was 0.158 and 4.74 number of birds, respectively. However, this value is likely to be unreliable as a large percentage of recorded kestrel flight activity involved hovering birds, and the CRM works in the assumption that these birds were constantly moving. The predicted collision risk is insignificant in the context of the local, county, national and international population taking account of Lewis *et al.* (2019) who estimated the 2011-2016 population at 13,500. The predicted annual loss represents ca. 0.00125% of the national population. The sparrowhawk collisions predicted per year and per thirty years was 0.0007 and 0.021 number of birds, respectively. The predicted collision risk is insignificant in the context of the local, county, national and	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of the effect is assessed as **Low**. **Low** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		international population taking account of Hardey *et al*. (2009) who estimated the 2011-2016 population of sparrowhawk at 11,859. No significant effects are anticipated regarding collision risks for these species at any geographical scale.			
Buzzard	Displacement and barrier effect	Pearce-Higgins (2009) describes that buzzard has been found to show significant turbine avoidance extending to at least 500m. Despite this, significant effects are not anticipated, given that extensive areas of suitable foraging habitat exist and will remain in the wider area (i.e. outside the 500m buffer zone). Extensive areas of suitable foraging habitat will remain post construction. Disturbance from operation is unlikely to discourage breeding attempts at the potential nest identified and the species is expected to habituate to the operation of the windfarm development. The felling of forestry may temporarily reduce the distribution and availability of trees of sufficient stature to provide potential nest sites. However significant areas of forestry suitable for breeding will remain.	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of the effect is assessed as **Medium**. **Low** Sensitivity + **Medium** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	The species was recorded flying with the potential collision risk zone during VP surveys. Opening up forestry through keyholing can create more suitable foraging and nesting habitat close to turbines. As noted in SNH (2016b), this may attract these birds into the wind farm site and increase the risk of collision mortality. The collision risk has been calculated at a ratio of 0.347	**Long-term Moderate Negative**	Negligible frequency. Reversible.	The magnitude of the effect is assessed as **Low**. **Low** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		collisions per year which equates to approximately 10.41 collisions every 30 years[27]. The estimated population size of Buzzards in Ireland by Rooney (2013) produced a figure of 3,312 breeding pairs for all Ireland, with approximately 1,500 pairs in the Republic of Ireland. Clements (2000) estimated recently colonised areas of buzzard at a density of 20 pairs of per 10km^2. The loss of 0.71 buzzards annually represents a loss of ca. 1.7% of the species from an area of 10km^2, considered to be a local level. The predicted collision risk is insignificant in the context of the county, national and international population. No significant effects are anticipated regarding collision risk at any geographical scale.			
Golden eagle	Displacement and barrier effect	Madders & Whitfield (2006) cite golden eagles as having potentially the highest sensitivity to displacement by windfarms, with range use changing in a pair of resident Scottish eagles after a wind farm was constructed within the territory, although definitive conclusions were confounded by a simultaneous habitat management plan	**Long-term Slight Negative,** given the small population in Ireland.	Negligible frequency. Reversible.	The magnitude of the effect is assessed as **Negligible**. **Low** Sensitivity species + **Negligible** Impact = **Negligible** effect significance. No likely significant effects at a

[27] With more than 21 collisions predicted every thirty years, buzzard has by far the highest predicted risk of collision with the proposed turbines at Drumnahough. One explanation for this involves two buzzards in March 2020 remaining at potential collision risk height (PCH) for more than 23 minutes each (46 minutes in total, or 2760 seconds) circling and displaying. This extended length of time spent during the winter at heights of between 20m and 150m almost certainly contributed to the high numbers of overall predicted buzzard collisions. This is evident from the significantly lower number of collisions predicted when only breeding season data is used in the model. The result decreases by 78% with a mean prediction of 4.66 buzzard collisions every thirty years.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		in the territory (Walker *et al.* 2005). Other studies in USA, however, have not noted any displacement effects due to the operation of wind farms (Madders & Whitfield 2006). The results of VP surveys indicate that this species does not regularly commute or forage over the site. The breeding territories for this species are based in Glenveagh National Park, located over 10km northwest of the proposed development, noting the breeding season core foraging range of 6km, with maximum range of up to 9km, as cited in SNH (2016a). The impact of the proposed development with regard to displacement and barrier effects is therefore not deemed a significant concern during the breeding season.			National level are predicted.
	Collision	The national population estimate for this re-introduced species is 2 according to Article 12 reporting, based on the number of territorial pairs that attempted to breed during the period 2011-2012. The number of pairs reported among the Irish ornithological fraternity is considered higher, at 8 – 10[28]. The collision risk has been calculated at 0.0165 collisions birds per year which equates to 0.495 birds every 30 years. The viability of this species is under pressure due to unpredictable breeding success (chick survival), scarcity of prey items and being threatened by persecution.	**Long-term Moderate Negative**	Negligible frequency. Reversible.	The magnitude of the effect is not easily established here given the small population. It is assessed as **Low**. This is based on an annual loss of <1% of the National population, noting that the Percival (2003) **Low** magnitude guide is for 1-5% of local population lost. **High** Sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a

[28] Source: John Murphy, ornithologist

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		In a study by Walker *et al.* (2005), resident golden eagles appeared to avoid a windfarm within their home range except when responding to intruders i.e. other eagles entering the territory. Walker *et al.* (2005) also point out that studies exist that show that birds (e.g. Osborn *et al.* 1998) including raptors (Curry and Kerlinger 1998) will try to avoid moving turbines. This corresponds with the high avoidance rates associated with the species (99%).			National level are predicted.
Hen harrier	Displacement and barrier effect	Displacement of foraging and flight behaviour has been recorded close to wind turbines in Britain (100m for foraging and 250m for flight) (Madders & Whitfield, 2006, Whitfield & Madders, 2006b, Pearce-Higgins *et al*. 2009a (cited in Wilson *et al.* 2015). A study of breeding birds around 12 upland wind farms in the UK found that hen harriers showed significant turbine avoidance out to at least 250m from the turbines (Pearce-Higgins *et al.* 2009).	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low** taking account of abundant suitable foraging in the hinterland. **High** Sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	Wilson-Parr (2013) estimates a mid-winter population range of 269-349 individuals. The collision risk has been calculated at 0.06 collisions over the 30-year life span of the proposed development (0.002/yr.). Taking the lower population of 269, the predicted loss incurs a 0.0005% decrease in the population. Taking the local population to be 3 pairs (based on the three grid squares adjacent to the south of the proposed development), the predicted loss is not considered significant.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Negligible**. **High** Sensitivity species + **Negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
Golden Plover	Displacement and barrier effect	A study by (Pearce-Higgins *et al*. 2009) found reduced use of habitat surrounding operating turbines, to within 200 m of the turbine base. A review of 29 other studies suggests golden plover will approach wind turbines to an average distance of 175 m in the non-breeding season (Hötker *et al.* 2006). Furthermore, post-construction monitoring at 15 upland wind farms showed no significant decline in populations post construction (Pearce-Higgins *et al.* 2012). There are extensive areas of suitable habitat in the wider area, outside any potential displacement buffer, should any potential displacement effect occur. Significant displacement effects are not anticipated.	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Negligible**. **High** Sensitivity species + **Negligible** Impact = **Minor** effect significance. No likely significant effects at a county level are predicted.
	Collision	Collision risk for waders is generally deemed to be low, due to a relatively low cursory flight path, coupled with high flight manoeuvrability (McGuinness *et. al* 2015). A review of pan-European collision assessments revealed much lower golden plover collision records than other species, though this was not controlled for survey effort or corpse recovery rates (Hötker *et al.* 2006). Golden plover was recorded flying within the potential collision risk zone during VP surveys. Golden plover is predicted to have 2.61 collisions every 30 years (0.087/yr.). Crowe & Holt (2013) estimated the number of golden plover wintering in Ireland between 2006/07 – 2010/11 as 99,870. The loss of golden plover 0.09 golden plover	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Negligible**. **High** Sensitivity species + **Negligible** Impact = **Negligible** effect significance. No likely significant effects at a county level are predicted.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		per year equates to an annual potential loss of 0.00002% of the estimated National population. This is insignificant in the context of the local, county, national population. No significant effects are anticipated regarding collision risk at any geographical scale.			
Snipe	Displacement and barrier effect	Some displacement may occur. Pierce-Higgins *et al* (2012) note that snipe densities did not recover after construction, and that levels of turbine avoidance suggest snipe breeding densities may be reduced within a 500 m buffer of the turbines by 15–53%. However, given the extent of suitable habitat in the wider area, significant displacement during the operation phase is not anticipated, with impacts limited to the proposed development site boundary.	**Long-term Moderate Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **High**. **Low** Sensitivity species + **High** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	This species has been shown to avoid turbines so no significant collision risk exists for this species.	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low**. **Low** Sensitivity species + Low Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Goosander	Displacement and barrier effect	There is no suitable foraging habitat within the proposed development site and taking account of a single observation during surveys, the displacement and barrier impacts on this species are minimal.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Negligible**. **High** Sensitivity species + **negligible** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	Goosander is a rare breeder, with just three 10km	**Long-term Slight**	Negligible	The magnitude of the effect is not

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		squares with breeding records in 2007-11, and an estimated population of 5 breeding pairs. The current breeding population (maximum of 5 pairs) is centred in Co. Wicklow where nest boxes have been used with some success. Occasional breeding has also been recorded in Co. Donegal. The collision risk has been calculated at a ratio of 0.009 collisions per year which equates to 0.27 birds every 30 years. The predicted loss of 0.009 goosander per year equates to an annual potential loss of 0.0005% of the estimated national population. This is insignificant in the context of the local, county, national population. No significant effects are anticipated regarding collision risk at any geographical scale.	**Negative**	frequency. Reversible.	easily established here given the small population. It is assessed as **Low**. **High** Sensitivity species + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Great black-backed gull	Displacement and barrier effect	There is no breeding habitat at the proposed development. During the operational phase of the wind farm significant displacement and barrier effects are not expected, mainly due to the low levels of activity recorded. Post construction, extensive suitable foraging and breeding habitat will remain, as there is an abundance of suitable habitat extending away from the site.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low**. **Low** Sensitivity + **Low** Impact = **Negligible** effect significance. No likely significant effects at a local level are predicted.
	Collision	The collision risk has been calculated at a ratio of 0.023 collisions per year which equates to 0.69 birds every 30 years. Mitchell *et al.* (2004) estimated the breeding national	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Medium**. **Low** Sensitivity + **Medium** Impact = **Minor** effect significance.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		population at 2445 pairs. The predicted loss of 0.023 birds per year equates to an annual potential loss of 0.0008% of the estimated national population. This is insignificant in the context of the local, county, national population. No significant effects are anticipated regarding collision risk at any geographical scale.			No likely significant effects at a local level are predicted.
Lesser Black-backed Gull	Displacement and barrier effect	No breeding habitat at the proposed development. During the operational phase of the wind farm significant displacement and barrier effects are not expected, mainly due to the low levels of activity recorded. Post construction, extensive suitable foraging and breeding habitat will remain, as there is an abundance of suitable habitat extending away from the site.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low**. **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	The collision risk has been calculated at 0.0635 collisions per year which equates to 1.9 birds every 30 years. The estimated national population size is 4,239 breeding pairs (Mitchell *et al.,* 2004). The predicted loss of 0.06birds per year equates to an annual potential loss of 0.0014% of the estimated national population. This is insignificant in the context of the county, national population. No significant effects are anticipated regarding collision risk at any geographical scale.	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low**. **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Grey Heron	Displacement and barrier effect	There will be minimal works at habitats potentially used by foraging heron. The site is of no particular value to this species. This species is expected to select higher value	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of displacement and barrier effects is considered **Low** - **Negligible**.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		foraging and breeding habitats available in the wider geographical area rather than any of the habitat types within the footprint of the proposal.			**Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	The collision risk has been calculated at 0.008 collisions per year which equates to 0.24 birds every 30 years. The estimated population size nationally is 3,087 breeding pairs (Crowe & Holt, 2013). The predicted loss of 0.01 birds per year equates to an annual potential loss of ca. 0.0003% of the estimated national population. This is insignificant in the context of the county, national population. No significant effects are anticipated regarding collision risk at any geographical scale.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of displacement and barrier effects is considered **Low** - **Negligible**. **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
Red grouse	Displacement and barrier effect	Red Grouse were found to recover within one year after disturbance caused by construction of wind farms (Pearce-Higgins *et al*. 2012). Operation could discourage foraging or breeding attempts in areas of suitable habitat at the windfarm proposed development site, but the site comprises mostly conifer plantation which is unsuitable habitat for the species. Operation is unlikely to discourage foraging or breeding attempts in the extensive areas of suitable habitat located outside the proposed windfarm development site. A study by Douglas *et al.* (2011) found no significant change in the relationships between grouse occurrence and either turbine or track proximity and found, no	**Long-term Slight Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low**. **Medium** Sensitivity + **Low** Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

KER & BoCCI status[22]	Potential impacts		Duration and Magnitude of potential impact[23]	Frequency and reversibility	Magnitude and Significance of effect[24]
		evidence for re-distribution in red grouse in response to wind farm operation.			
	Collision	This species was not recorded flying at the potential collision risk height during the extensive VP survey work undertaken. While collision risk modelling cannot be carried out, this does not mean that the collision risk cannot be assessed, but instead it means that the collision risk, within the accuracy levels available to the assessment, is zero.	**None**	Negligible frequency. Reversible.	No impact. No likely significant effects at a local level are predicted.
Passerines (meadow pipit, grey wagtail)	Displacement and barrier effect	The construction phase of the proposed development may temporarily result in some disturbance, or displacement for passerines. Existing activities at the site include forestry operations, including felling, and thinning of forestry. Overall, disturbance during construction phase of the proposed development is unlikely to discourage flight activity, foraging or breeding in the proximity of the site.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low.** **Medium** Sensitivity species + negligible Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.
	Collision	Collision risk of passerines cannot be ruled out but the risk associated with this group is low taking account of their general tendency to fly low.	**Long-term Imperceptible Negative**	Negligible frequency. Reversible.	The magnitude of effect is assessed as **Low.** **Medium** Sensitivity + negligible Impact = **Minor** effect significance. No likely significant effects at a local level are predicted.

7.3.3 Decommissioning Phase

The impacts of decommissioning a wind farm are potentially similar to construction impacts, but it is anticipated that underground cables connecting the turbines to the selected substation will be cut back and left underground, thereby reducing potential impacts as discussed in **Section 7.3.1** above. The cables will not be removed if Environmental Assessment of the decommissioning operation demonstrates that this would do more harm than leaving them *in situ*. If the cables are left *in situ* then no reinstatement works along cable routes will be required and the associated environmental impact of proposed development decommissioning will be minimal. The assessment will be carried out closer to the time to take into account environmental changes over the proposed development life.

Hardstand areas will be remediated to match the existing landscape thus requiring restoration or reforestation. Access roads will be left for use by the landowner. The current view is that the disturbance associated with the removal and disposal of the material would be more deleterious than leaving them in place.

Prior to wind turbine removal, due consideration will be given to any potential impacts arising from the decommissioning operations. Some of the potential issues could include:

- Temporary disturbance, and or displacement;
- Potential disturbance to wintering, and breeding species such as merlin, by the presence of machinery, and personnel on-site;

The decommissioning phase of the proposed development could result in disturbance to local bird species using the site. Bird species may be disturbed by the noise and physical presence and activities of personnel and machinery during decommissioning works. Bird species may also become temporarily displaced during decommissioning activities. Disturbance, likely to be temporary however, may result in displacement of birds from an area which can result in effective habitat loss or a reduction in the quality of the habitat, thereby leading to a reduction in bird density locally (Pearce-Higgins, 2009).

Prior to the decommissioning work, a comprehensive reinstatement proposal, including the implementation of a program that details the removal of structures and landscaping, will be submitted to the relevant competent authority for approval. To avoid potential impacts on nesting birds, decommissioning activities will be timed to avoid the main period of sensitivity for breeding birds (March 1st to August 31st), where such activities may directly impact or disturb breeding birds.

The removal of turbines from the site will potentially result in direct positive effects associated with the return of semi-natural habitat to areas which previously contained hardstands and turbine bases. Overall, it is considered that decommissioning activities will result in **Permanent Slight Positive Effects** with the removal of all turbines and associated collision risk.

Using EPA (2017) criteria, disturbance, and or displacement effects during the decommissioning phase are expected to be **Temporary Slight Negative.**

7.3.4 Cumulative Impacts

According to SNH, the cumulative effect of a set of projects is the combined effect of all the projects, taken together (SNH, 2005). This includes approved and existing projects. The following account of land management and climate change, and the implications for birds has been taken from Irish Wildlife Manual No. 115 'Countryside bird survey: status and trends of common and widespread breeding birds 1998-2016' by Lewis *et al.* (2019).

7.3.4.1 Land Management

Agricultural land covers over 70% of Ireland's total land area, with grassland accounting for around 86% of that total and cropland the remaining 14% (CSO, 2016). Forestry accounts for a further 10.6% of total land area (CSO, 2016) and Ireland is projected to increase forest cover by 15,000ha annually to reach targets of 18% forest cover by 2046 (DAFM, 2014). Therefore, how agricultural land and forestry is managed has a far-reaching influence on the status and trends of our countryside bird populations. Such intensification in recent decades (particularly since the 1970s) has been implicated in far-reaching changes to the Irish landscape with the drivers of farming intensification and afforestation associated (either directly or indirectly) with declines in abundance and range of many countryside bird populations (Colhoun & Cummins, 2013) through changes in suitable habitat extent and quality. Government policy e.g. 'Food Wise 2025' will significantly increase agri-food exports in the coming years which will necessitate more intensive agricultural activity at various spatial scales. While Food Wise 2025 plans highlight the need for sustainability, there are concerns that such a significant and rapid increase in agricultural outputs will come at a cost to birds and other biodiversity.

Changes to agricultural land that have 'simplified' the landscape in terms of habitat, as part of a drive towards greater intensification, has also had an indirect effect on raptors such as kestrel through the loss of suitable hunting habitat, the loss of habitat connectivity through hedgerow removal, and reduced prey base (small birds and mammals) (Butet *et al*., 2010).

In 2016, 3,135 tonnes of pesticides (active ingredient) were used on Irish agricultural land (via Pesticides Registration and Control Division of the Dept. of Agriculture). Pesticides, directly and indirectly, reduce the diversity and quantity of food available to farmland birds including insect abundance and seed/weed abundance, both prey groups being so important in supporting overwinter survival of farmland birds (Whispear & Davies, 2005). The use of herbicides and insecticides on agricultural land, as well as recreational land, constitutes a low-level pressure and threat for many birds in the wider countryside by removing sources of food that can be important to help secure breeding success and overwinter survival at key times during the year.

The impact of a new conifer plantation on bird communities can be variable depending largely on the land use and management prior to afforestation (Wilson *et al*., 2012). For instance, Graham *et al*. (2015) found that the density of bird species of conservation concern increased in response to the planting of intensively managed grassland sites (i.e. improved agricultural grassland) but decreased when forestry was planted on peatlands and less intensively managed grasslands.

The establishment of forestry also facilitates increased densities of mammalian predators and avian mesopredators (i.e. mid-ranking predators in the middle of the trophic level) which can lead to increases in predation for ground-nesting birds. Lewis *et al.* (2019) point out that commercial

afforestation has traditionally comprised of mainly non-native coniferous tree species such as sitka spruce and lodgepole pine in Ireland. Although the spread of such afforestation has been beneficial to a handful of bird species, including goldcrest, siskin and redpoll, it has resulted in the loss of tracts of other habitats, particularly grasslands and peatlands, which in turn has likely to have contributed to the recorded declines in meadow pipit and skylark breeding populations.

The practice of burning heather in upland areas to encourage new growth for sheep grazing, can have an impact on ground nesting birds such as meadow pipit, skylark and stonechat, especially if carried out during or close to the breeding season (Lewis *et al,* 2019). This can have an impact on birds of prey such as merlin and sparrowhawk. There was no evidence of burning or peat harvesting within or adjacent to the proposed development site, and these activities will not be exacerbated, rather the opposite with the proposed development.

Taking into account the already modified nature of the proposed development and wider study area (past and present forestry operations), the potential for significant cumulative impacts are considered unlikely to be significant, and **Long term Imperceptible Negative** at most. Land use changes associated with the proposed development will take place during construction and decommissioning, with a 30 year interval between these phases. No likely significant effects on local avifauna are predicted. Merlin for example have adapted to the proliferation of commercial forestry in the locality, with a breeding pair within the proposed development site in the 2017/2018, 2018/2019 and 2019/2020 seasons.

7.3.4.2 Climate Change

By the middle of this century, Ireland is projected to have significantly lower mean annual precipitation levels, particularly during the summer (Nolan et al., 2017). The frequency of heavy precipitation events is projected to increase during the autumn and winter months however, as are the number of extended dry periods during summer and autumn (Nolan et al., 2017). Changes in temperature and precipitation at different times of the year may result in changes to food availability (Robinson et al., 2007) and habitat distribution (Berry et al., 2002) and energy expenditure for both resident and migratory bird populations that will likely have population-level impacts at varying temporal and spatial scales. Pearce-Higgins et al. (2015) identified hot, dry summer weather as having a negative impact (via desiccation of larval stages of invertebrates with a time lag) on some bird populations' e.g. upland birds. The effect was greatest in species that rely on subsurface invertebrates (e.g. worms, fly larvae) as well as habitat specialists, with knock-on negative effects for the 'species specialization index' of bird communities in a given area. Salewski *et al.* (2013) found that severity of winter weather was associated with survival of some resident and partial-migrant species (the Blackbird and the Dunnock respectively), with higher apparent survival in warmer winters and those with fewer days of snow cover.

In Ireland, periods of prolonged cold winter and spring weather (e.g. winters 2010/11 and 2011/12) negatively affect the numbers of resident species including goldcrest, grey wagtail, long-tailed tit, meadow pipit, mistle thrush, song thrush, robin, skylark, stonechat and treecreeper (CBS survey data). In spring 2018, a cold weather frontal system known as the 'Beast from the East', brought freezing temperatures and heavy snow cover to many parts of the country (Met Eireann Archive March 2018, unpublished data). This cold-weather front is considered to have adversely affected many resident insectivores. Despite predictions for increased average temperatures in Ireland in the

future (e.g. Murphy et al., 2019), any increase in relatively short-term severe winter weather conditions including heavy rainfall or snow, particularly when coupled with sub-zero temperatures, will cause high mortality in these species (Dobinson & Richards, 1964; Cawthorne & Marchant, 1980) which can impact subsequent recovery in the short and medium-term.

The proposed development will produce a net gain in terms of carbon budgets. Overall, with construction energy expenditure considered, the proposed development will reduce the need for fossil fuel energy over the lifetime of proposed construction and operation. This can be expected to benefit the environment in terms of climate change. The overall reduction in CO_2 emissions due to the proposed development is assessed as **Long-term Imperceptible Positive**. No significant effects on local avifauna are predicted with regard to climate change and cumulative impacts.

7.3.4.3 Wind Farm Development

A number of wind energy developments exist, or are planned in the area surrounding the proposed development (**see Figure 7- 9**) and **Table 7- 17**). There are twelve wind energy developments within 10km of the proposed development.

Table 7- 17 Wind energy developments have taken place, or are planned in the area surrounding the proposed development.

Wind Farm	Site Status	No. of Turbines	Tip height (m)
Cark Extension	Operational	4	67.5
Cark RES	Operational	25	67.5
Culliagh, including extension	Operational	21	68.5
Lenalea	Permitted	9	130
Ballystrang	Operational	6	74
Cark	Operational	4	67.5
Meenahorna	Operational	7	100
Meenalaban	Operational	7	121.2
Meenycat	Operational	9	-
Menagrauv	Operational	4	75
Meenanilta	Operational	6	75
Meenbog	Operational	3	-

The potential negative cumulative effects of wind turbines on birds include the barrier effect that can be caused by a number of wind farms occurring at a geographical location (Drewitt & Langston, 2006). The findings in Madders & Whitfield (2006) indicate that displacement effects of wind turbines on raptors are negligible for the most part. For example, Madders and Whitfield (2006) and Wilson *et al*. (2015), indicate that turbines in a landscape do not constitute any impediment to hen harrier movement for example. It is predicted that the operational cumulative effect on raptors will not be significant. This assessment is based on multiple raptor records for numerous species within adjacent operational wind farm sites, where these birds continue to forage and commute.

Multiple wind farms in an area can have a cumulative impact of collision mortality, depending on the scale and distance between projects and also the bird species that occur in an area. Mortality from collision is associated with very high numbers of turbines and densities of birds. The key question is whether any combined bird mortality will have a significant effect on populations of species of

conservation concern. Species that do not fly regularly at turbine height (e.g. red grouse and many small passerines) are unlikely to be affected at an individual proposed development or at a cumulative level. Species that could potentially be significantly affected are those which have a large foraging range, and where the numbers of individuals in a local population are of conservation concern (e.g. raptors or species of wildfowl).

Recent research by Fernández-Bellon *et al.* (2018) on Irish windfarms found that large wind farms held lower densities of open-habitat species such as meadow pipit, skylark and wheatear (Lewis *et al.*, 2019). This effect is possibly down to differences in habitat quality, land-use or habitat management, or possibly the susceptibility of different species to disturbances from either human activity or the movement of the turbine blades themselves. Fernández-Bellon *et al.* (2018) also highlight the need to further understand the interactions between land-use change and upland ecology, particularly in the context of potential impacts of continued growth in wind energy development and potential cumulative impacts with afforestation, agricultural intensification and climate change (Fernández-Bellon *et al.*, 2018). The most sensitive species at the proposed development site is probably merlin. Meadow pipit and skylark have been reported as the predominant prey species of merlin by previous research in Ireland and Britain (Watson 1979, Rae 2010).

The potential displacement and collision cumulative impacts of the proposed development directly west and northwest of a cluster of wind farms has been considered. A reasonable quantitative cumulative collision risk assessment could not be undertaken given the lack of flight data available for other local wind energy developments and the absence of collision risk modelling for earlier wind energy planning applications. Significant cumulative population level impacts on birds are not envisaged for the following reasons:

- The area proposed for development and adjacent wind farm sites do not contain particularly sensitive habitats or key populations of vulnerable bird species;
- The loss and alteration of habitat at the proposed development site and neighbouring wind farms is not considered significant in terms of area, as most of the wind energy infrastructure will be constructed on, or have been built on already modified habitats of low ecological value (commercial forestry, roads);
- Turbines at the proposed development site (this was subject to technical constraints including the need for greater separation between larger turbines) have been sited close together to minimize the development footprint (for commercial and visual purposes);
- The turbine blades at the proposed development site will be finished to a white, off-white or grey colour to correspond with the colour scheme of existing turbines - high visibility patterns can help reduce collision risk (at least in conditions of good visibility);
- Based on the surveys carried out for the proposed wind farm, and also for adjacent wind farms, the proposed development site or environs will not blocks birds using regular flight lines between nesting and foraging areas[29], nor has it been found on the basis of ongoing bird monitoring that the adjoining wind farms built to date and operational interact cumulatively to create an extensive barrier leading to diversions of birds, noting the

[29] Flight line information available in seasonal bird survey reports

presence of Greenland white-fronted goose, whooper swan and golden plover in the environs of the site. Numbers of these birds recorded at and adjacent to the proposed development were small and or/irregular, while flocks of migratory birds were seen flying during migratory journeys. The environs of the proposed development site are of no particular importance to birds, reducing the potential for cumulative impacts. Lough Deele to the east is perhaps the most important wetland feature in the area, and waterbirds frequent this lake despite the presence of existing wind farms (Lenalea, Cark, Cark Res and Cark Extension), Lenalea wind farm situated between Lough Deele and the proposed development site;

- Meenbog wind farm is operational and lies ca. 1.5km south of the proposed development site. Post construction bird monitoring of Meenbog wind farm site took place in 2011 (Natural Environment Ltd, 2011), 2013 (Natural Environment Ltd, 2014) and in 2015-16 (Partridge, 2016). No birds were found during the corpse searches, indicating the low level collision effect on birds;
- Avian monitoring as part of wind energy development mitigation has shown merlin have been using Cark Mountain and environs for foraging in recent years. This area includes existing operating wind turbines associated with Cark and Lenalea Wind Farms. Due to its hunting technique of opportunistically ambushing prey, merlin generally flies low to the ground and this behaviour keeps the species below the area swept by turbines. Merlin have often been recorded flying within the aforementioned wind farms with no apparent avoidance of turbines due to their low flying nature (see individual bird survey reports for flight paths); and
- The proposed development will not require overhead transmission cables as all ducting will be underground, eliminating this avoidance/collision risk, with the exception of a short length of loop-in connection proposed as part of the alternative grid connection option. It is anticipated that the length this loop-in will be less than 50m long given that the connection line occurs directly adjacent to the northern boundary of the proposed grid connection to the permitted Lenalea substation. The presence of high visibility wires markers on the existing transmission powerlines will also reduce potential bird strikes in this area.

While there is no certainty as to the benefit or disadvantage of wind turbines and commercial forestry, the proposed development site already harbours a seemingly stable passerine population. The proposed development site was found to support a good population of meadow pipit, occurring in a variety of habitats (young commercial forestry, verges, heath). This could explain the presence of a merlin nest, where the locality obviously provides adequate food supply for raptors with a primarily passerine diet. The proposed development is not expected to bring about any significant change in biomass of potential prey items for merlin as commercial forestry is the primary habitat impacted, and more conifer verges will be available to passerines which have adapted to this characteristic and which are hunted by merlin. It is considered that the proposed development is sustainable after evaluation of the potential cumulative impacts of wind energy on local habitats and avifauna. This takes account of merlin, a sensitive species that ambushes its prey near to the ground. Due to its foraging nature, merlin will generally flies under the area swept by the proposed turbine rotors.

It is considered that the in-combination impact of the proposed development on birds will be **Long term imperceptible negative**. The predicted in-combination effect is not considered significant.

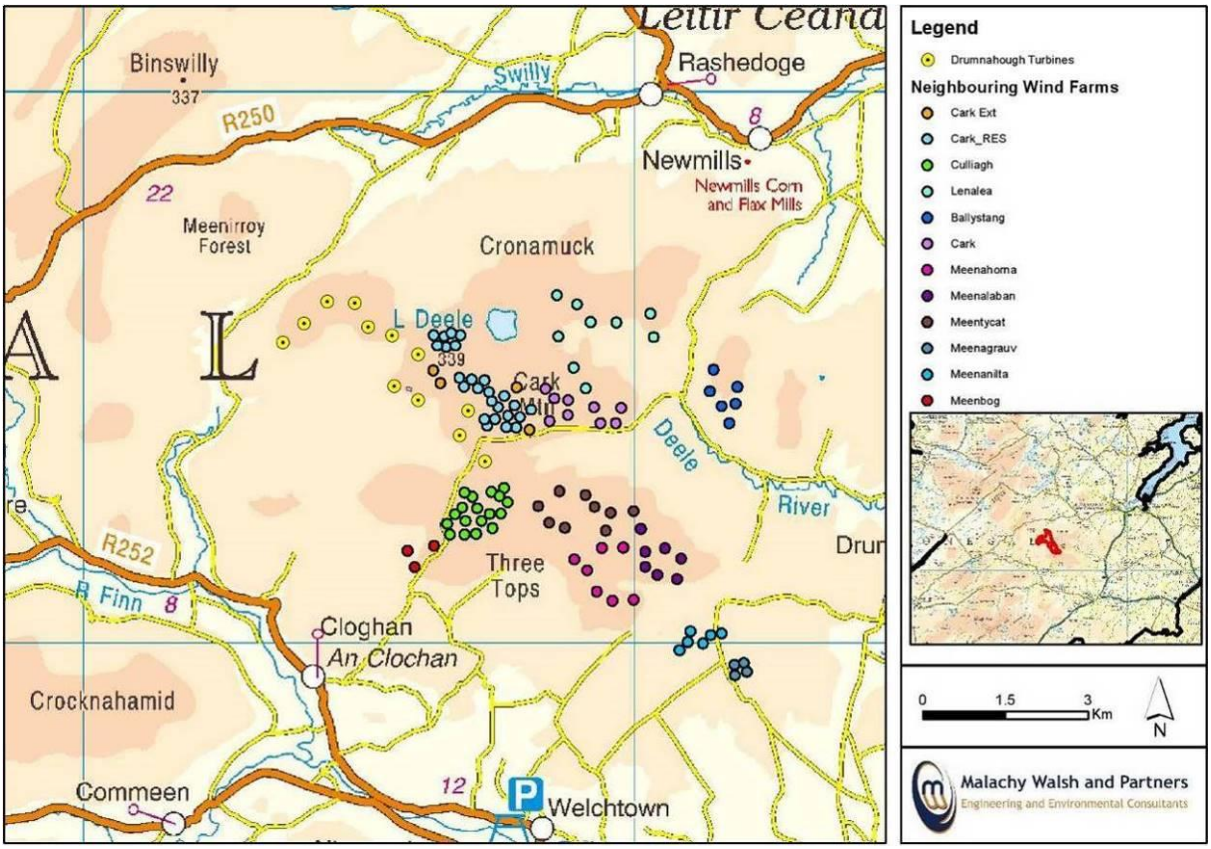

Figure 7- 9 Wind energy developments have taken place, or are planned in the area surrounding the proposed development

7.4 MITIGATION

7.4.1 Mitigation by Design

Consultation between the design team (Project Manager, Project Engineers, Project Ecologists, Project Ornithologists) and the developer was conducted on an ongoing basis during the design phase, in order to formulate a proposed development design which will avoid, by design and at source, any construction activities, and minimise habitat loss for bird species, such as merlin. As a consequence, all aspects of the proposed development, including layout adopted avoidance by design approach. During the wind farm design process, all attempts were made to ensure the footprint of the proposed development was located on the least ecologically sensitive areas to minimise potentially significant habitat loss effects. The turbines are mainly located in the existing commercial forestry at the site.

The project design has included the following measures to reduce the potential for significant effects on avian receptors, including:

- Avoidance with buffer or set back distance for new infrastructure from an identified successful merlin nest site;

- Avoidance and minimizing infrastructure placement on high quality bogland habitats (turbine array and wind farm infrastructures located away from the better quality, and natural foraging and nesting habitat for species);
- Avoidance of a potential barrier effect on birds, the turbines have been positioned at distances greater than 500m apart as per recommendations in Percival (2001);
- Hard-standing areas have been designed to the minimum size necessary to support the anticipated turbine model;
- Grid connection to the permitted Lenalea substation compared to an alternative option has been selected to utilise existing or permitted infrastructure for the entire length (i.e. collector circuit cables to be laid within/adjacent to public roads). Cables will be laid underground to avoid effects on roadside hedgerows and disturbance to nesting birds;
- Construction of access roads and areas of hard standing will be kept to a minimum to reduce habitat loss as much as possible; and
- Direct habitat loss will be minimised by upgrading existing access tracks, where possible.

A main ornithological driver of the design was the presence of merlin which nested at the proposed development site in 2018 and 2019. This species is listed on Annex I of the EU Birds Directive, so is afforded European protection. The design of the project includes a buffer between the merlin nest site and turbines. This buffer distance was based on findings of Ruddock & Whitfield (2007) who suggested distances between 200m and 500m, dependent on topographical factors. The proposed development infrastructure and nest are screened by conifer plantation and the nest site is at greater elevation than the nearest proposed development components. Following guidance from an SSE ecologist, a 350m buffer was proposed.With regard to buffer calculation, NPWS advised to use the central point of the merlin nest sites recorded each year. This approach was adopted and infrastructure was designed to place all elements of the proposed development at a distance considered sufficient to avoid potential impacts from the proposed development resulting likely significant effects on the territory/breeding pair.

High visibility wires markers would be installed on the loop-in transmission powerline connection proposed as part of the alternative grid connection option.

7.4.2 Project Ornithologist

A Project Ornithologist with appropriate expertise and recognised long-term ornithological experience will conduct pre-construction and construction phase bird surveys at the site, including the monitoring of merlin.

7.4.3 Pre-construction Avian Monitoring

It is considered that the main potentially significant impact the windfarm may pose is disturbance/destruction of a nest during the construction phase. Merlin is considered the most vulnerable species in this regard. It was concluded in Lusby *et al.* (2017) that although merlin predominantly nested in conifer plantations, the presence of nearby open suitable foraging habitats influenced nest site selection and breeding success. The nesting preference of merlin makes them vulnerable to disturbance from forest operations associated with the proposed development which requires mitigation.

A pre-construction breeding verification survey designed by an ornithologist will be conducted from late February at the proposed wind farm development location and adjacent to assess any evidence of merlin activity or taking up territories. Merlin may occupy a site as early as late February and the final juvenile dispersal may occur as late as late September (Hardy *et al*. 2009).

The findings of a study by Lusby *et al.* (2011) emphasise considerable difficulties with monitoring merlin in Ireland. Due to numerous factors associated with their nesting ecology and their discrete breeding behaviour, it is generally accepted that the merlin is a difficult species to survey (Ayers and Anderson 1999 in Lusby *et al.,* 2011). Furthermore, forest nesting merlin are considered more difficult to find compared with ground nesting pairs (Hardey *et al.* 2009, Norriss *et al*. 2010). According to Lusby *et al.* (2011), BWI survey carried out six watches on three active nests without any observations. This stresses the discrete nature of the species and reinforces the fact that absence of breeding Merlin cannot be determined from negative results. In relation to the required timing and duration of vantage point watches, it must be noted that no merlin encounters were recorded over two three-hour periods (11:00-14:00 and 18:00-21:00) on a full day during a June survey at Glenveagh, despite the fact that watches focused on the active nest area. These watches were within the time frame recommended by Hardey *et al*. (2009), indicating that the duration of vantage point watches should be extended beyond three hours to afford greater confidence in the results. The ornithologist carrying out the survey will therefore require adequate experience in merlin surveying, including identification of nest sites.

Should merlin be present within 350m of proposed works, then construction works within this zone will be restricted to outside the breeding season (i.e. October - February inclusive). Merlin begin courtship displays between late March and early May before laying in May (Hardey *et al*. 2009). This area must be avoided from March to September if nesting continues.

If breeding activity is identified, the nest site location will be determined as accurately as possible and no construction works shall be undertaken within a 350m buffer. If the nest location shifts closer to proposed infrastructure, no construction works shall be permitted until it can be demonstrated that that merlin are no longer reliant on the nest site. Vehicular movement along roads within the 350m buffer will be permitted once they have been constructed/widened, with agreement from NPWS.

A common method used to prescribe buffer zones involves one or two measures of disturbance distance as given in Ruddock and Whitfield (2007): 'alert distance' (AD), the distance between the disturbance source and the animal at the point where the animal changes its behaviour in response to the approaching disturbance source; and 'flight initiation distance' (FID), the point at which the animal flushes or otherwise moves away from the approaching disturbance source. Recommendations on 'safe-working distances' (essentially, buffer zones around breeding sites) have been made for a number of UK breeding bird species. Ruddock and Whitfield (2007) have analysed expert opinion solicited on 'static' and 'active' disturbance distances (i.e. AD and FID, respectively) when birds were approached by a single pedestrian when incubating eggs and when with chicks. Ruddock and Whitfield (2007) noted the difficulty in independently validating the results because relatively few empirical studies had been conducted on disturbance distances for the study species. A buffer of 350m is deemed appropriate for the previously observed merlin nest at the proposed

development site for the following reasons, based on Ruddock & Whitfield (2007) and current activity at the site:

- The wide range of opinions on the typical distance at which nesting merlins may be disturbed by an approaching human with, for example, static disturbance during incubation ranging from <10 m to 300 – 500 m, the median 'static' disturbance distance given as 225m.
- Like most other raptors, if previously exposed to relatively innocuous disturbance, merlins are capable of developing a tolerance to relatively high levels of at least some forms of human disturbance when free from direct interference. There is frequent human activity at the proposed development site (forestry operations, avian monitoring) via existing roads used to access the site. Given that merlin continue to nest at location identified, it is considered that they have habituated to human presence.
- There is a stand of conifer trees between the nest site and the proposed development infrastructure, these trees acting as a visual and sound screen for merlin nesting at the identified location.

7.4.4 General Construction Mitigation Measures

The general construction mitigation measures below will be followed:

- Displacement and or disturbance impacts, and habitat degradation will be limited by controlling the movement of vehicles; vehicles will not encroach onto habitats beyond the proposed development footprint
- The felling of forestry and any vegetation clearance required, including the cut back, and any clearance of hedgerows, and scrub will take place outside the breeding season (March to August, inclusive), unless permission is obtained from NPWS outside of these times.
- Where possible, construction will take place outside the breeding season to minimise disturbance, and or displacement to breeding birds, but where works are necessary, there will be commitment to undertake relevant pre-work checks by the ECoW/ornithologist;
- All plant and equipment will conform with the Construction Plant and Equipment Permissible Noise Levels Regulations 1996 (SI 359/1996) and other relevant legislation.
- Plant and equipment will be turned off when not in use, with no unnecessary revving.

7.4.5 Avian Monitoring

The construction phase of the project will likely be spread across the summer and winter survey periods. Vantage point surveys will be carried out as outlined in **Section 7.1.5** above prior to and during construction works. The primary focus would be merlin. but all species would be recorded in line with standard methodology. If it is the case that a merlin nest is detected within 350m of the permitted construction works or within the general location of the wind farm site, the following will be carried out:

- The Project Ornithologist (or ECoW if suitably qualified) will immediately notify NPWS;
- The location of the nest will be treated as an ecological sensitive area, and will be kept private;
- All high impact, and heavy construction works will be suspended within 350m of any merlin nest site; and

- The Project Ornithologist/ECoW will monitor the ecological sensitive area, and will liaise with NPWS.

7.4.6 CEMP

A Construction and Environmental Management Plan (CEMP) has been prepared. The final CEMP will be in place prior to the start of the construction phase and will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board. An Ecological Clerk of Works (ECoW) will be appointed for the construction phase of the project. Duties will include:

- Deliver Tool Box Talks, informing on-site personnel of the ornithological and ecological sensitivities within the proposed development site;
- Liaise with Project Ornithologist/ECoW), discussing issues that may arise;
- Provide guidance to contractors to ensure site is compliant with legislation; and
- Liaising with NPWS, Local Authorities, other consenting authorities and other relevant bodies with regular updates in relation to construction progress.

Measures to help reduce suitability to avifauna

The availability of prey in an area will also influence whether raptors choose to nest. Merlin specialise in catching small birds that they hunt over open ground, along forest edges, or sometimes over the canopy (SNH, 2016b). Ground vegetation would be managed to a height of 1m or less in keyhole felled areas. This measure was adapted from SNH (2016b) and would be followed to help reduce the likelihood of nesting and associated aerial courtship behaviour around turbines.

7.4.7 Operational Phase Avian Monitoring

Bird surveys will continue during the operational phase at the VP locations used pre-construction, taking note of any bird behaviour indicative of avoidance, change of activity from baseline studies. The timing and extent of bird surveys will be agreed with NPWS. If there are detectable changes in bird behaviour or if collisions are found to be greater than those predicted, then additional mitigation such as curtailing operation times may be required. A detailed Operational Avian Monitoring Programme will be prepared for the operational phase of the project. The monitoring programme at a minimum will include:

- Breeding bird surveys (with particular focus on merlin);
- Winter bird surveys; and
- Targeted bird collision surveys (corpse searches).

7.4.8 Consultations

Consultations will remain ongoing with NPWS throughout the operational phase of the project.

7.4.9 Decommissioning Phase

If it is decided to decommission the wind farm at the end of its operational life of 30 years, a comprehensive reinstatement proposal, including the implementation of a program that details the removal of all structures and landscaping, will be submitted to Donegal County Council, and NPWS for approval prior to the decommissioning work.

An environmental assessment will be undertaken at that time to ascertain whether or not it would be more or less environmentally damaging to remove or keep in place the underground cables and access tracks. All elements of the decommissioning works will be agreed with Donegal County Council beforehand and there will be a consent requirement for decommissioning works.

The Drumnahough Wind Farm will be in operation for 30 years. Decommissioning will adhere to best practice at the time and implement appropriate mitigation measures.

7.5 RESIDUAL IMPACTS

Significant residual impacts are impacts that remain, once mitigation has been implemented or, impacts that cannot be mitigated. With the avoidance measures (design phase), and full implementation of mitigation measures throughout the construction phase, operational phase, and decommissioning phase of the project, significant residual effects on avian KERs are not expected.

7.6 CONCLUSION

The following is concluded with regard to the proposed Drumnahough Wind Farm taking account of mitigation outlined in **Section 7.4**:

- No significant effects are predicted on birds due to habitat loss or habitat alteration during the construction, operational or decommissioning phases of the project.
- Once the 350m merlin buffer is in place, no residual significant effects are predicted on birds due to disturbance, displacement, and barrier effects during the construction or operational or decommissioning phases of the project.
- The proposed development will not result in significant collision effects on bird species.
- The proposed development will not result in significant cumulative impacts in combination with forestry, agriculture and other wind farms in the area.
- The proposed development will not result in any significant residual effects on any of the avian KERs either alone, or cumulatively, in combination with other projects.

It is considered that the proposed development can be built without significant effects on avifauna at the local and county scale. The ecosystems supporting birds at the local and county level are regarded as having sufficient resilience to perturbation that allows them to tolerate some biophysical change, as in the case of the proposed development. This is evidenced through obtainable monitoring results in adjacent/nearby wind farms, where some of the most sensitive species continue to use wind farm sites, without obvious negative effects.

The ecosystems at and surrounding the proposed development are considered to have the capacity to accommodate change at the level predicted without significant effects on birds.

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