MWP

Chapter 07 Ornithology

Brittas Wind Farm Project

Brittas Wind Farm Ltd

November 2024

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MWP, Engineering and Environmental Consultants
Address: Reen Point, Blennerville, Tralee, Co. Kerry, V92 X2TK
www.mwp.ie

7 Ornithology

7.1 Introduction

This chapter considers the potential effects on ornithological features arising from the Proposed Project. A full description of the Proposed Project, development lands and all associated project elements is provided in Chapter 2 of this EIAR. The nature and probability of effects on avian ecology arising from the overall project has been assessed. As per the CIEEM (2018, updated 2022) EcIA guidelines this assessment involves:

- A review of the existing receiving environment
- Identifying and characterising impacts and their effects
- Incorporating measures to avoid and mitigate negative impacts and effects
- Assessing the significance of any residual effects after mitigation
- Identifying appropriate compensation measures to offset significant residual effects
- Identifying opportunities for ecological enhancement

This chapter is supported by the following technical appendices:

Appendix 7A: Brittas Wind Farm: Ornithological monitoring - results report October 2021 to September 2023
Appendix 7B: BTO species codes
Appendix 7C: Survey effort and weather conditions
Appendix 7D: Viewshed analysis
Appendix 7E: VP data for target species - maps and tables
Appendix 7F: Breeding bird survey results
Appendix 7G: Indicative breeding territory mapping for target species
Appendix 7H: Avian Collision Risk Modelling report
Appendix 7I: Brittas Wind Farm: Ornithological monitoring - results report: October 2020 to August 2021

To avoid duplication the full list of the references used in this chapter is provided at the end of **Appendix 7A**.

The use of species names within this report will be the generally accepted common names in English, following those in normal usage in Ireland. Where appropriate prefixes such as common, European, Eurasian or other geographic nomenclature are not used, e.g. golden plover as opposed to European golden plover, lapwing as opposed to northern lapwing, buzzard as opposed to common buzzard. Use of scientific names is kept to a minimum and a list of both scientific and common names of birds covered in this report is provided in **Appendix 7A**: Table 7A.1.

The following provides a list of terminology and acronyms commonly used within this chapter:

AA	Appropriate Assessment
Aggregate flight time:	Number birds x flight seconds for each observation
BoCCI	Birds of Conservation Concern in Ireland. A publication which assesses the all-Ireland conservation status of birds. The status of birds are reviewed and updated approximately every 5 years, with current assessment covering the period 2020-2026 (Gilbert et al. 2021)[1].
BoP	Bird of prey - in this assessment this includes all species of raptors (osprey, eagles, buzzards, kites, harriers, hawks, falcons) and owls
BWI	BirdWatch Ireland

[1] BoCCI red and amber list is available from BWI website at: https://birdwatchireland.ie/publications/birds-of-conservation-concern-in-ireland-bocci4-2020-2026/

CRM	Collision Risk Model – see **Appendix 7H**
CRZ	Collision Risk Zone = zone of influence where birds are assumed to be at risk of collision (SNH, 2017), which for this site is taken as flight time occurring within the 500 m proposed turbine buffer and at heights between 25 to 180 m
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
Construction corridor	Also referred to as the works corridor or area = zone of influence for construction works. Direct effects were assessed within 20 m of the proposed site infrastructure, with this reduced to a 5 m corridor along the proposed grid connection route. Indirect effects were assessed with regard to types of works proposed and the sensitivities of the ornithological receptor, as published
EPA	Environmental Protection Agency[2]
FID	Flight Initiation Distance – distance at which bird(s) will take flight in response to disturbance
GCR	Grid connection route
IEF	Important Ecological Feature, synonymous with Key Ecological or Ornithological Receptor (KER or KOR)
I-WeBS	Irish Wetland Bird Surveys[3]
NHA/pNHA	Natural Heritage Area/proposed Natural Heritage Area
NIS	Natura Impact Statement
NPWS	National Parks & Wildlife Service[4]
NRA	National Roads Authority, now Transport Infrastructure Ireland (TII)[5]
SAC	Special Area of Conservation
SPA	Special Protection Area
SCI	Special Conservation Interest – bird species or feature for which SPA are designated, Qualifying Interest (QI) applies to habitats or species for which SACs are designated
SNH	Scottish Natural Heritage, the former name for NatureScot, which provides much of the guidance pertaining to ornithological impact assessment for wind farms
VP	Vantage Point – fixed point from which ornithological surveys (VP watches) are undertaken
TDR	Turbine delivery route
TII	Transport Infrastructure Ireland, previously National Roads Authority (NRA)
Waterbirds	Group of bird species that are ecologically dependent on wetlands, which includes coastal and inshore habitats. The grouping is used synonymously with wetland birds and in an Irish context includes the following subgroupings: swans, geese, ducks, divers, grebes, cormorant, shag, herons, rails, crakes, waders, gulls, terns and kingfisher. Note: Some species grouped as seabirds also fall within the waterbird grouping, notably this is the case with cormorants, and some species of gulls and terns which breed and/or winter at inland locations.
ZoI	Zone of Influence – see **Section 7.2.2** and **Section 7.2.4.1.**

[2] EPA information and data available at: https://www.epa.ie/
[3] I-WeBS information and data available at: https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/
[4] NPWS information and data available at: https://www.npws.ie/
[5] TII/NRA information available at: https://www.tii.ie/en/technical-services/environment/

7.1.1 Competency of Assessor

The assessment was completed by ecologists from APEM Group, trading as Woodrow Sustainable Solutions Limited (APEM Group - Woodrow) in Ireland. This ornithological impact assessment has been reviewed and approved by Mike Trewby who is an Associate Director at APEM Group Woodrow. Mike worked for Birdwatch Ireland from 2003 to 2010 conducting research on red-billed chough, red grouse and breeding seabirds. Prior to joining Woodrow in 2016, Mike worked as an independent ornithological consultant and has over 20 years fieldwork and research experience in the field of ecology. Mike regularly undertakes impact assessments for large scale developments and is a full member of CIEEM. Mike's qualifications include a Post Graduate Diploma in Environmental Studies from University of Strathclyde (2002) and a BSc in Zoology & Botany from University of Namibia (1997).

7.1.2 Legislation and policy, guidance and information sources

The following legislation, guidance and sources of ornithological information have been considered in carrying out this assessment:

A complete reference list is provided at the end of Appendix 7A.

7.1.2.1 Legislation and policy

International legislation

- EU Habitats Directive (Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora)
- EU Birds Directive (Directive 2009/147/EC on the conservation of wild birds)
- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982)
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983)
- The International Convention on Wetlands of International Importance (the Ramsar Convention, 1971)
- UN Convention on Biological Diversity (CBD, 1993)

National legislation

- The Wildlife Acts 1976 (as amended)
- The Wildlife (Amendment) Act 2023
- EC (Birds and Natural Habitat) Regulations 2011
- National Heritage Plan
- Fourth National Biodiversity Action Plan 2023 – 2030

Local policy

- Tipperary County Development Plan 2022-2028
- County Tipperary Biodiversity Action Plan 2025-2030 – Discussion Paper (in consultation phase)
- Thurles and Environs Local Area Plan 2024-2030

7.1.2.2 Guidance documents and sources of ecological information

Guidelines on the information to be contained in Environmental Impact Statements (EIS):

- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022)
- European Commission (2017) Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report. (Directive 2011/92/EU as amended by 2014/52/EU)
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes

- CIEEM (2018, updated 2024). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester

Guidelines for field survey methodology:

- Bibby, C. J., Burgess, N. D. & Hill, D. A. & Mustoe, S. (2000). *Bird Census Techniques (Second edition)*. Academic Press, London.
- BWI & NPWS. *I-WeBS Counter Manual. Guidelines for Irish Wetland Bird Survey counters*. BirdWatch Ireland.
- Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird Monitoring Methods*. Published by the RSPB in association with BTO, WWT, JNCC, ITE & Seabird Group, Sandy.
- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: A field guide to survey and monitoring* (Third Edition). The Stationary Office, Edinburgh.
- Lewis, L. J. & Tierney, T. D. (2014). Low tide waterbird surveys: survey methods and guidance notes. *Irish Wildlife Manuals*, No. 80. NPWS, Department of Arts, Heritage and the Gaeltacht, Ireland
- O'Brien, M. & Smith, K. W. (1992). Changes in the status of waders breeding on wet lowland grassland in England and Wales between 1982 and 1989. *Bird Study,* 39, 165-176.
- O'Donoghue, B. (2019). Survey Guide: *Hen harrier roost types and guidelines to roost watching*. IHHWS - Irish Hen Harrier Winter Survey.
- Scottish Natural Heritage, now NatureScot - SNH (2009). *Monitoring the impact of onshore wind farms on birds*. Scottish Natural Heritage, Inverness, Scotland.
- Scottish Natural Heritage, now NatureScot - SNH (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms*. SNH Guidance Note (Version 2: March 2017 update).
- TII – Transport Infrastructure Ireland (2021). *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects*. TII Publications: Planning and Evaluation PE-ENV-07005, April 2021.
- University College Cork Ornithology Group (2021). *Breeding Woodcock Survey 2021*.

Guidelines for Collision Risk Modelling:

- Band, W., Madders, M., & Whitfield, D. P. (2007). Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farm Sites. In: de Lucas, M., Janss, G. & Ferrer, M. (Eds) 2007. *Birds and Wind Farms – Risk Assessment and Mitigation*. Quercus Editions, Madrid, 259-279.
- Furness, R.W. (2019). *Avoidance rates of herring gull, great black-backed gull and common gull for use in the assessment of terrestrial wind farms in Scotland*. Scottish Natural Heritage Research Report No. 1019.
- Scottish Natural Heritage, now NatureScot – SNH (2000). *Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note.
- Scottish Natural Heritage, now NatureScot - SNH (2013). *Avoidance rates for wintering species of geese in Scotland at onshore wind farms*. Scottish Natural Heritage.
- Scottish Natural Heritage, now NatureScot – SNH (2018a). *Avoidance rates for the onshore SNH wind farm collision risk model*. Version 2.

Guidance for ornithological impact assessment:

- Cutts, N., Hemingway, K. & J Spencer, J. (2013). *Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning & Construction Projects*. University of Hull, TIDE – Tidal River Development, Environment Agency.
- Goodship, N. & Furness, R.W. (2019). Seaweed hand-harvesting: literature review of disturbance distances and vulnerabilities of marine and coastal birds. *Scottish Natural Heritage Research Report* No. 1096.
- Goodship, N. M. & Furness, R. W. (2022). Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. *NatureScot Research Report* No. 1283.
- Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). *Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland*. BirdWatch Ireland, Kilcoole, Wicklow.

- NatureScot (2023). *Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds - Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges*. NatureScot
- NPWS (2013). *A review of the SPA network of sites in the Republic of Ireland*. December 2013, NPWS, Department of Arts, Heritage and the Gaeltacht.
- Percival, S.M. (2003). *Birds and Wind Farms in Ireland: A Review of Potential Issues and Impact Assessment.* Sustainable Energy Ireland
- Ruddock, M. & Whitfield, D. (2007). *A review of disturbance distances in selected bird species*. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage
- Scottish National Heritage, now NatureScot - SNH (2016). *Assessing Connectivity with Special Protection Areas (SPAs)*. SNH Guidance Note.
- Scottish National Heritage, now NatureScot - SNH (2018b). *Assessing significance of impacts from onshore wind farms out with designated areas*. Scottish Natural Heritage, Inverness, Scotland.
- Scottish National Heritage, now NatureScot - SNH (2018c). *Assessing the cumulative impacts of onshore wind farms on birds*. Scottish Natural Heritage, Inverness, Scotland.
- Tosh, D.G., Montgomery, W.I. & Reid, N. (2014). *A review of the impacts of wind energy developments on biodiversity*. Report prepared by the Natural Heritage Research Partnership (NHRP) between Quercus, Queen's University Belfast and the Northern Ireland Environment Agency (NIEA) for the Research and Development Series No. 14/02.

Main publications assessing avian populations and distribution in Ireland:

- Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. & Fuller, R. J. (2013). *Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland*. BTO Books, Thetford.
- Burke, B., McElwaine, J. G., Fitzgerald, N., Kelly, S. B. A., McCulloch, N., Walsh, A. J. & Lewis, L.J. (2021). Population size, breeding success and habitat use of Whooper Swan *Cygnus cygnus* and Bewick's Swan Cygnus *columbianus bewickii* in Ireland: results of the 2020 International Swan Census. *Irish Birds*, 45, 57-70.
- Burke, B., Fitzgerald, N., Kelly, S. & Lewis, L.J. (2022). *Greylag and Pink-footed geese in Ireland 2017/18-19/20*. Irish Wetland Bird Survey (I-WeBS) Report. BirdWatch Ireland, Wicklow
- Colhoun, K. & Cummins, S. (2013). Birds of Conservation Concern in Ireland 2014–2019. *Irish Birds* 9: 523—544.
- Colhoun, K., Flannelly, F., O'Neill, J., Phelan, E., Servignat, H., O'Donoghue, B. & Kelly, S. (2022). Status and distribution of breeding Eurasian Curlew in Ireland 2021. *Irish Wildlife Manuals*, No. 138. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Crowe. O, Tierney, T. D. & Burke, B. (2021). Status of Rare Breeding Birds across the island of Ireland, 2013–2018. *Irish Birds* 43 29-38
- Cummins, S., Fisher, J., McKeever, R.G., McNaughten, L. & Crowe, O. (2010). *Assessment of the distribution and abundance of Kingfisher Alcedo atthis and other riparian birds on six SAC river systems in Ireland*. BWI report to NPWS
- Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019). The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. *Irish Wildlife Manuals*, No. 114. NPWS, Department of Culture, Heritage and the Gaeltacht, Ireland.
- Fox, T., Francis, I., Norriss, D. & Walsh, A. (2021). *Report of the 2019/20 International census of Greenland white-fronted geese*. Greenland White-fronted Goose Study, Rønde, Denmark and Wexford, Ireland.
- Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.
- Kennedy, J., Burke, B., Fitzgerald, N., Kelly, S.B.A., Walsh, A.J. & Lewis, L.J. (2022). *Irish Wetland Bird Survey: I-WeBS National and Site Trends Report 1994/95 – 2019/20*. BirdWatch Ireland Waterbird Report to the National Parks and Wildlife Service. BirdWatch Ireland, Wicklow.
- Lauder, C. & Donaghy, A. (2008). *Breeding Waders in Ireland 2008: A Review and Recommendations for Future Action*. Unpublished report to the National Parks and Wildlife Service, Dublin, Ireland

- Lauder, A. & Lauder, C. (2020). Identification of breeding waterbird hotspots in Ireland. *Irish Wildlife Manuals*, No. 129. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Lewis, L. J., Coombes, D., Burke, B., O'Halloran, J., Walsh, A., Tierney, T. D. & Cummins, S. (2019a). Countryside Bird Survey: Status and trends of common and widespread breeding birds 1998-2016. *Irish Wildlife Manuals*, No. 115. NPWS, Department of Culture, Heritage and the Gaeltacht, Ireland.
- Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019b). Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. *Irish Wildlife Manuals*, No. 106. NPWS, Department of Culture, Heritage and the Gaeltacht, Ireland.
- NPWS (2019). Annex B – *Bird species' status and trends report format (Article 12) for the period 2013 – 2018*. Accessed (August 2024) via EIONET Central Data Repository
- NPWS (2022). *Hen Harrier Conservation and the Wind Energy Sector in Ireland*. Supporting document to the Hen Harrier Threat Response Plan. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage
- Ruddock, M., Wilson-Parr, R., Lusby, J., Connolly, F., J. Bailey, & O'Toole, L. (2024). The 2022 National Survey of breeding Hen Harrier in Ireland. Report prepared by Irish Raptor Study Group (IRSG), BirdWatch Ireland (BWI), Golden Eagle Trust (GET) for National Parks & Wildlife Service (NPWS). *Irish Wildlife Manuals*, No. 147. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

7.2 Methodology

7.2.1 Desk Study

The scope and approach taken for the ornithological desk study is detailed in Appendix 7A.

Based on the ornithological data and other sources of information available, the desk study identified any sensitive bird populations occurring or potentially occurring in the vicinity of the Proposed Project Site, including examining the potential for ecological connectivity with European Sites designated for birds - Special Protection Areas (SPAs) and other designated sites that have an ornithological interest, such Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs). The following resources were reviewed to investigate distribution and occurrence of sensitive species in relation to the Proposed Project, habitat availability within and surrounding the Proposed Project, and potential connectivity between the Proposed Project and important ornithological sites:

- National Parks and Wildlife Services (NPWS) Designations Viewer, accessed via https://www.npws.ie/maps-and-data - designated sites data also downloaded to local GIS and was used to investigate the distribution of designated sites in relation to the Proposed Project. Species for which SPA were designated was reviewed using NPWS (2013) *A review of the SPA network of sites in the Republic of Ireland*. December 2013, accessed via https://www.npws.ie/publications;
- Potential for connectivity was investigated using ranges for species published in SNH (2016), with species specific Irish studies reviewed for merlin (Lusby et al., 2017) and for barn owl (Lusby & O 'Cleary, 2014), with updates provided by NatureScot (2023) for seabirds;
- Environmental Protection Agency (EPA) Water Maps, accessed via https://gis.epa.ie/EPAMaps/Water - river flow network was also downloaded to local GIS and was used to investigate hydrological connectivity between the Proposed Project and designated sites;
- A range of ortho-imagery and 6-inch mapping was viewed to investigate habitat availability, including: Google EarthPro, Google Maps, and Ordnance Survey Ireland – GeoHive;
- Office of Public Works (OPW) national flood information portal, specifically Flood Maps was used to identify occurrence of temporary wetlands that may attract wintering waterbirds, accessed via https://www.floodinfo.ie/map/floodmaps/;

- The location of wetland sites monitored by Irish Wetland Birds Survey (IWeBS) and associated data was reviewed using online map of I-WeBS site and relevant site peak counts, accessed via: https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/
- Bird records were collated from the National Biodiversity Data Centre (NBDC) database, using the report function on Biodiversity Maps to generate a biological records data report for the 10 km Irish National grid square encompassing the Proposed Project [S16] assessed via: https://maps.biodiversityireland.ie/
- NBDC - Biodiversity Maps was used to view Bird Sensitivity Mapping to Wind Energy, as per Mc Guinness et al. (2015), accessed https://maps.biodiversityireland.ie/Map
- Publications detailing the distribution of bird species in Ireland, including:
  - Bird atlases: Sharrock (1976), Gibbons et al. (1993), Hutchinson (1989), Balmer et al. (2013), with updates for rare breeding birds provided by Crowe et al. (2021)
  - Breeding hen harrier: Norriss et al. (2002), Barton et al. (2006), Ruddock et al. (2012, 2016), with updates provided by Ruddock et al. (2024) and NPWS (2022) - the latter also provides information on the distribution of winter roosts
  - Kingfisher: Cummins et al. (2010)
  - Wintering waterbirds: Crowe (2005), Boland & Crowe (2012), Burke et al. (2018), Lewis et al. (2019b)
  - Geese and swans: Boland & Crowe (2008), Fox et al. (2021), Burke et al. (2021), Burke et al. (2022)
  - Breeding waterbird hotspots: Lauder & Lauder (2020)
  - Breeding waders: Lauder & Donaghy (2008), with updates on curlew provided by Colhoun et al. (2022)
  - Breeding seabirds: Cummins et al. (2019)

7.2.2 Ornithological study areas

The field surveys conducted to inform the ecological impact assessment were undertaken with regard to the potential for ornithological receptors to occur, as determined by the desk study including a review of historical distributional data for bird species and habitat suitability/availability for potential sensitive receptors; with consideration given to the specific sensitivities of ornithological receptors in relation to the potential zone of influence of the Proposed Project.

Based on recommendations in SNH (2017) and core ranges for potentially sensitivity species, as detailed in SNH (2016), a range of different study areas were used for bird surveys including:

- 500 m viable area/proposed turbine buffer: Vantage point (VP) watch to assess avian collision risk;
- 1 km viable area/proposed turbine buffer: Search area for potential barn owl sites;
- 2 km viable area/proposed turbine buffer: Breeding raptor surveys
- 2 km viable area/proposed turbine buffer: Hen harrier winter roost surveys targeting suitable habitat; and,
- 5-10 km viable area/proposed turbine buffer: Wider area wintering bird surveys.

In order to ensure the ornithological study areas covered the final proposed turbine layout, buffers were initially applied to a potential viable build area for wind turbines, as shown by Figure 7A.1 in **Appendix 7A**.

7.2.3 Field Surveys

Methodologies utilised for ornithological surveys adhere to the relevant NatureScot (formerly SNH) guidance, specifically SNH (2017). Two years of ornithological surveys are recommended by the NatureScot guidelines unless it can be demonstrated that a single year of data is sufficiently robust and appropriate for assessing the potential impacts. In this case, six full seasons, i.e. three years of data were collected, spanning from October 2020 to September 2023.

Two years of field surveys (Year 2 & Year 3: October 2021 to September 2023) were completed by APEM Group Woodrow and for full details of methodologies, along with summaries of survey effort refer to **Appendix 7A**:

Section 7A.3, with Appendix 7C providing full details for survey effort, including timings of visit and weather conditions. The preliminary study year (Year 1: October 2020 to September 2021) was completed by Fehily Timoney and details of field surveys are provided in Appendix 7I.

In summary the following field surveys were completed:

- Vantage point (VP) watches covering the 500 m proposed turbine buffer with a minimum of 36 hours per VP per season completed
- Breeding bird surveys covering the 500 m proposed turbine buffer, including:
  - Sampling the habitat types employing adapted common bird census (CBC) methodology, as described in Gilbert et al. (1998) summarising Marchant (1983) and Marchant et al. (1990);
  - Lowland breeding wader surveys targeting suitable habitat and including optimal timings for recording breeding snipe, as described in Gilbert et al. (1998) summarising O'Brien & Smith (1992);
  - Dusk surveys targeting suitable habitats for crepuscular/nocturnal woodland species, specifically long-eared owl and woodcock, as well as other rarer species like nightjar, if occurring, as detailed in Gilbert et al. (1998), Hardey et al. (2013) and UCC Irish Woodcock Project (UCC Ornithology Group, 2021).
  - Kingfisher habitat suitability surveys targeting the River Suir within the 500 m proposed turbine buffer, as described in Cummins et al. (2010);
- Wider area surveys for breeding birds of prey targeting suitable habitat out to 2 km from the proposed turbine locations for most species, as detailed in Hardey et al. (2013). For barn owl searches, as detailed in TII (2021) targeted old buildings and veteran trees within 1 km of proposed turbine location, as recommended by SNH (2017);
- Winter walkover surveys covering the 500 m proposed turbine buffer used to generate counts of winter waterbirds;
- Wider area winter hen harrier roost searches covering suitable habitat (Clarke & Watson, 1990, O'Donoghue, 2019) out to 2 km from proposed turbine locations as recommended by SNH (2017) and employing methods described in Hardey et al. (2013) and O'Donoghue (2019); and,
- Wider area wintering waterbird surveys covering wetlands out to 10 km from proposed turbine locations over winter 2020/21 and out to 5-6 km from proposed turbine locations over winters 2021/22 and 2022/23, employing I-WeBS approach of monthly count sites with modifications for recording locations and behaviours of birds based on Lewis & Tierney (2014).

7.2.3.1 Additional field surveys

Additional walkover surveys of the proposed electrical substation were undertaken over the breeding season of 2024 to investigate habitat availability for breeding birds and determine the occurrence of any sensitive species, including lapwing and snipe. Visits were conducted on the 31 May 2024 and 05 June 2024. The area of the substation was also covered over the winter on 08 February 2024, when the proposed grid connection was surveyed and habitat suitability for any sensitive species noted. During the core survey period for the baseline study, the grid connection route was covered as part of wider area wintering waterbird surveys and breeding raptor surveys. Avian flight activity over the location of the electrical substation was covered from VP2.

As detailed in Chapter 2, several pinch points along the turbine delivery route require vegetation removal. The sections where vegetation removal is required within and adjacent to the Proposed Project Site, i.e. occurring within the townland of Brittas were assessed on 24 February 2024 for habitat suitability to support any sensitive

species. This included the treeline/hedgerow along the Rossestown Road (L8017) where the proposed site entrances will be located and the turn off the N62 onto the Rossestown Road, where removal a broadleaved plantation and road widening will be required. Avian activity in these areas was monitored during the core survey period for the baseline study from VP3 and VP4, as well as while undertaking wider area ornithological surveys.

7.2.3.2 Survey limitations

Appendix 7A: Section 7A.38 provides a full statement on any survey limitations that were identified. This statement concludes that overall, despite some minor limitations, sufficient data was collected over the study period to identify any ornithological constraints that may arise for the Proposed Project and inform the ornithological impact assessment. Given that three years of survey data are available to inform the ornithological baseline and impact assessment, any minor gaps in survey effort are compensated for and importantly, it is considered that overall the surveys completed allow for all sensitive ornithological receptors to be identified and potential for likely significant effects to be robustly assessed.

7.2.3.3 Collison risk modelling

Appendix 7H provides a detailed method statement detailing the application of collision risk modelling.

VP watches are conducted to collect flight line data which can then be used to model collision risk. The flight risk volume applied in this analysis is derived from a buffer extending 500 m from the proposed turbine locations, which for the Proposed Project equates to an area of 490.53 ha. Flights occurring within the 500 m proposed turbine buffer and at heights of between 25 m and 180 m above ground level were defined as being within the collision risk zone (CRZ). A height band of 25-180 m was selected as this represents the minimum and maximum rotor swept heights of all turbine types being assessed, as derived from blade length and hub height. Three sets of turbine specifications were assessed, hereafter referred to as Turbine Type A, Turbine Type B and Turbine Type C. The specification used to test collision risk for each turbine type is as follows:

Turbine type	Rotor swept dimensions	Rotor diameter	Hub height	Max rotor chord	Blade pitch	Rotational period
Type A	30 m to 180 m	150 m	105.0 m	4.2 m	6°	6.85 sec
Type B	25 m to 180 m	155 m	102.5 m	4.5 m	6°	6.85 sec
Type C	31 m to 180 m	149 m	105.0 m	4.2 m	6°	6.85 sec

Flight time applied in the CRMs used aggregated flight seconds recorded for target species, i.e. number birds x flight seconds for each observation, occurring at collision risk height (25-180 m) and within 500 m proposed turbine buffer. For target species generating sufficient levels of flight time within the CRZ, data sets were run through a collision risk model (CRM), as detailed in Scottish Natural Heritage (SNH, 2000) and Band et al. (2007), employing avoidance rates as given in SNH (2018a). This provides estimates of the number of collisions per annum and for the lifetime of the proposed wind turbines (35 years). Due to differences in the number of vantage points employed, only flight line data when four VPs were used in Year 2 and Year 3 were applied in the CRM (October 2021 to September 2023). Based on the observed aggregate flight times within the CRZ, collision risk models were run for 12 species, including:

- Black-headed gull 1,035 flight seconds in CRZ
- Buzzard 41,192 flight seconds in CRZ
- Cormorant 989 flight seconds in CRZ
- Golden plover 719,967 flight seconds in CRZ
- Grey heron 1,306 flight seconds in CRZ
- Kestrel 5,225 flight seconds in CRZ
- Lapwing 531,730 flight seconds in CRZ

- Lesser black-backed gull 52,161 flight seconds in CRZ
- Little egret 721 flight seconds in CRZ
- Peregrine 1,107 flight seconds in CRZ
- Snipe 480 flight seconds in CRZ
- Sparrowhawk 785 flight seconds in CRZ

Although recorded within the 500 m proposed turbine buffer, CRMs were not run for the following target species: common gull, dunlin, green sandpiper, hen harrier, mallard, mute swan, swift, whimbrel, whooper swan and wigeon; as flight times and/or the number flight observations recorded within the CRZ for these species, with the exception of swift, were too low to draw any significant conclusions in relation to predicted collision risk.

As detailed in Appendix 7H, for target species where the initial CRMs identify predicted collision risk of more than one bird over 35 years, further analysis is undertaken including running CRMs using flight times for the slightly smaller CRZ (30 to 180 m), examining the effects of different operational parameters, in particular rotational period of the turbines, investigating seasonal variation in collision risk, and reviewing the appropriateness of applying default avoidance rates.

7.2.4 Methodology for assessment of effects

This section outlines the approach taken, with reference to appropriate guidance documents, to assess the effects of the Proposed Project on the ornithological receptors identified within the zone of influence. The overarching guidance document is *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine* published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018, updated 2022), with reference to other guidance documents where appropriate, including Percival (2003), NRA (2009) and EPA (2022).

7.2.4.1 Identifying ornithological features within the Zone of Influence

Information obtained during the desk study and field surveys identifies ornithological features which are likely to be affected by the Proposed Project and as such, occur within the 'zone of influence' of the Proposed Project.

The zone of influence depends on the type of development taking place, its likely impacts and the presence of ecological connections which enable such impacts to affect sensitive ornithological features. The zone of influence may extend well beyond the boundaries of the Proposed Project Site, due to the presence of ecological connections with an ornithological feature of interest. Conversely, ornithological features that have no ecological connection with the Proposed Project Site are not within its zone of influence, regardless of the proximity to the Proposed Project, as no pathway for impacts exists.

All ecological and/or hydrological connections which provide pathways for impacts between the Proposed Project Site and ecological features in the surrounding area are identified and described in the ecological baseline.

In terms of the zone of influence for construction works, potential for direct effects to occur were assessed within 20 m of the proposed site infrastructure, including temporary features (site compound, deposition areas) and for the grid connection route, this was reduced to a 5 m corridor along the route. This assessment area is referred to as the works/construction corridor within this chapter. Indirect effect on ecological receptors to works occurring within the construction corridor are assessed with regard to types of works proposed and the sensitives of the ornithological receptor, as reviewed and published in SNH (2016), Goodship & Furness (2022) updating Ruddock & Whitfield (2007), Cutts et al. (2013) and Goodship & Furness (2019). – see reference list in Section 7.1.2.2,

In terms of the zone of influence for the Proposed Project once operational, the infrastructural footprint is assessed for the effects of long-term habitat loss on avian populations and potential hydrological connectivity to the River Suir.

For operational turbines, species-specific sensitivities are assessed for birds by examining evidence from post-construction studies to determine likelihood of displacement effects occurring and zones of sensitivity. An assessment of collision risk is undertaken for flight activity of target species occurring at heights within the proposed rotor swept area (25-180 m) and in the 500 m proposed turbine buffer.

7.2.4.2 Ecological Value – geographic context

As per CIEEM (2018, updated 2022) ornithological features which occur within the zone of influence are evaluated in geographic hierarchy of importance, international through to local. The categories applied to geographic scale in this evaluation are based on those listed in NRA (2009), which in an ornithological context are defined in Table 7-2.

7.2.4.3 Identification and characterisation of effects

Determination of the significance of an effect will be made in accordance with the terminology outlined in the EPA (2022) guidelines which are set out in Table 7-3. The assessment will describe those characteristics that are relevant to understanding the ecological effect and determining the significance, and as such does not need to incorporate all stated characteristics (CIEEM, 2018, updated 2019).

7.2.4.4 Assessment criteria for ornithological effects

In order to systematically classify any population level effects on ornithological receptors this ornithological impact assessment follows Percival (2003). The significance of likely effects on a given bird population is evaluated by using documented information when available, in conjunction with experience and professional ornithological judgement, to integrate the scales of species sensitivity/conservation importance (Table 7-4), behavioural sensitivity (Table 7-5) and the predicted magnitude of spatial effects (Table 7-6), with consideration also given to temporal effects. For consistency, the timeframes used in Percival (2003) to define temporal effects were modified to bring them in line with EPA (2020) guidelines for describing duration and frequency of effect, as detailed in Table 7-3. In making judgements on significance, consideration is given to the population status, trends and distribution of the potentially affected species within Ireland, as published – see reference list in Section 7.1.2.2.

By combining the conservation importance (population sensitivity) and the estimated magnitude of impact into the matrix in Table 7-7, an assessment of the overall significance of effects on bird species can be made.

7.2.4.5 Assessment of cumulative impacts and effects

SNH (2018c) provides guidelines for the assessment of cumulative impacts and effects of onshore wind farms ornithological receptors. Section 7.4.7 outlines the approach taken for identifying potential sources of cumulative impacts and assessing the cumulative effects of the Proposed Project on sensitive avian receptors, together with other relevant project or plans.

7.2.5 Scoped out from Further Assessment

Likely significant resulting from barrier effects (a form of displacement) due to the Proposed Project were scoped out of the assessment, as discussed in the preamble of Section 7.4.3 under operational phase - likely secondary effects on ornithological receptors.

Table 7-1 provides a list of avian important ecological features (IEFs) and identifies the potential for likely significant effects on ornithological receptors recorded by the baseline in absence of mitigation, with consideration given to the existing on-site conditions and design phase (embedded) mitigation by avoidance of sensitive receptors.

Avian IEFs which can be excluded from further assessment (scoped out) due to low occurrence are also identified in Table 7-1 and further judication for exclusion is provided in the species accounts – see Section 7.3. The baseline study determined that the Proposed Project Site was not ecological important for the following avian IEFs based on low recorded usage over a three year study period and that there is no potential for likely significant effects and these species can be scoped out from any further assessment:

- Greylag goose see Section 7.3.4.1
- Whimbrel see Section 7.3.4.11
- Dunlin see Section 7.3.4.12
- Green sandpiper see Section 7.3.4.16
- Common gull see Section 7.3.4.18
- Great black-backed gull see Section 7.3.4.19
- Herring gull see Section 7.3.4.20
- Hen harrier see Section 7.3.5.2
- Merlin see Section 7.3.5.5
- Short-eared owl see Section 7.3.5.9

Section 7.4.7.1 provides the approach taken in scoping of other project or plans for consideration within the assessment of cumulative impacts and effects.

Table 7-1: Avian Important Ecological Features (IEF) and potential for likely significant effects

Does effect require assessment? - **Y** = yes or **N** = no or N = avian feature can be scoped out based on information available

				Construction			Operational			
Species	**Seasonal occurrence**	**Ornithological Importance (NRA, 2009)**	**Conservation Importance (Percival, 2003)**	**Direct effects -** mortality, e.g. due destruction of a breeding/ roosting site	**Disturbance/ displacement**	**Deterioration in water quality**	**Direct effects - collision risk**	**Long-term habitat loss to infrastructure**	**Disturbance/ displacement**	**Long-term deterioration in water quality**
Lapwing	Breeding & wintering	Breeding: Nationally Winter: County	Breeding: High sensitivity Winter: Medium sensitivity	Breeding: **Y**	**y**	**N**	**Y**	**Y**	**Y**	**N**
Golden plover	Wintering	County (regional)	Medium sensitivity	**N**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Snipe	Breeding & wintering	County (regional)	Medium sensitivity	Breeding: Y	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Black-headed gull	All year	County (regional)	Medium sensitivity	**N**	**N**	**N**	**Y**	**Y**	**Y**	**N**
Lesser black-backed gull	All year	County (regional)	Medium sensitivity	**N**	**N**	**N**	**Y**	**Y**	**Y**	**N**
Cormorant	All year	County (regional)	Medium sensitivity	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
Whooper swan	Winter	County (regional)	Medium sensitivity	**N**	**Y**	**N**	**N**	**Y**	**Y**	**N**
Shoveler	Winter	County (regional)	Medium sensitivity	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**
Curlew	Winter	County (regional)	Medium sensitivity	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**
Kingfisher	All year	County (regional)	Medium sensitivity	**N**	**N**	**Y**	**N**	**Y**	**Y**	**Y**
Grey heron	All year	County (regional)	Medium/Low sensitivity	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
Little egret	All year	County (regional)	Medium/Low sensitivity	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
Mute swan	Breeding & wintering	Local (higher value)	Low sensitivity	Breeding: **Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Wigeon	Wintering	Local (higher value)	Low sensitivity	**N**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Mallard	Breeding & wintering	Local (higher value)	Low sensitivity	Breeding: **Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Teal	Wintering	Local (higher value)	Low sensitivity	**N**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Jack snipe	Wintering	Local (higher value)	Low sensitivity	**N**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Woodcock	Wintering	Local (higher value)	Low sensitivity	Roosting: **Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N**
Greylag goose	Winter	Site not important	Scoped out	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Whimbrel	Winter	Site not important	Scoped out	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Dunlin	Winter	Site not important	Scoped out	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Green sandpiper	Winter	Site not important	Scoped out	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Common gull	Winter	Site not important	Scoped out	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Great black-backed gull	Winter	Site not important	Scoped out	**N**	**N**	**N**	**N**	**N**	**N**	**N**

				Construction			Operational			
Species	**Seasonal occurrence**	**Ornithological Importance (NRA, 2009)**	**Conservation Importance (Percival, 2003)**	**Direct effects -** mortality, e.g. due destruction of a breeding/ roosting site	**Disturbance/ displacement**	**Deterioration in water quality**	**Direct effects - collision risk**	**Long-term habitat loss to infrastructure**	**Disturbance/ displacement**	**Long-term deterioration in water quality**
Herring gull	Winter	Site not important	Scoped out	N	N	N	N	N	N	N
Kestrel	All year	County (regional)	Medium sensitivity	Breeding: Y	Y	N	Y	Y	Y	N
Barn owl	All year	County (regional)	Medium sensitivity	Breeding: Y	Y	N	Y	Y	Y	N
Peregrine	All year	County (regional)	Medium/Low sensitivity	N	Y	N	Y	Y	Y	N
Sparrowhawk	All year	Local (higher value)	Low sensitivity	Breeding: Y	Y	N	Y	Y	Y	N
Buzzard	All year	Local (higher value)	Low sensitivity	Breeding: Y	Y	N	Y	Y	Y	N
Long-eared owl	All year	Local (higher value)	Low sensitivity	Breeding: Y	Y	N	Y	Y	Y	N
Hen harrier	n/a	Site not important	Scoped out	N	N	N	N	N	N	N
Merlin	Winter	Site not important	Scoped out	N	N	N	N	N	N	N
Short-eared owl	Winter	Site not important	Scoped out	N	N	N	N	N	N	N
Swift	Summer foraging	County (regional)	Medium sensitivity	N	N	N	Y	Y	Y	N
Stock dove	Breeding	Local (higher value)	Medium sensitivity	Y	Y	N	N	Y	Y	N
Redwing	Wintering	Local (higher value)	Medium sensitivity	N	Y	N	N	Y	Y	N
Meadow pipit	Breeding & wintering	Local (higher value)	Medium sensitivity	Breeding: Y	Y	N	N	Y	Y	N
Grey wagtail	Breeding & wintering	Local (higher value)	Medium sensitivity	Breeding: Y	Y	Y	N	Y	Y	Y
Yellowhammer	Breeding & wintering	Local (higher value)	Medium sensitivity	Breeding: Y	Y	N	N	Y	Y	N
Amber listed passerines: brambling†, goldcrest*, house martin°, house sparrow°, linnet*, sand martin°, skylark*, spotted flycatcher*, starling°, swallow° & willow warbler*	Breeding*, wintering†, present°	Local (higher value)	Low sensitivity	Y: breeding birds	Y	N	N	Y	Y	N

7.2.6 Statement on Limitations and Difficulties Encountered

The information contained in this chapter includes robust data which has been used to assess the likely significant effects of the Proposed Project on avian receptors. No substantial limitations were identified in terms of scale, scope or context in the preparation of this assessment.

The following minor survey and data analysis limitations were encountered and have been fully accounted for in the impact assessment:

- Section 7A.3.8 in Appendix 7A provides a full statement on any survey limitations and concludes that overall, despite the minor limitations identified, sufficient data was collected over the study period to identify any ornithological constraints that may arise for the Proposed Project and inform the ornithological impact assessment.
- As accounted for in this assessment collision risk modelling may not provide representative outputs for certain species, including species like snipe and sparrowhawk, which can prove elusive in more distant parts of the viewsheds for VPs. To account for this limitation additional CRMs were run to test a range of hypothetical flight times and a precautionary assessment for collisions risk was taken.
- Swift were initially considered as a secondary target species, as prior to Gilbert et al. (2021) they were amber listed. The upgrading of the conservation status of this species to red has been accounted for in the CRM by running a series of CRMs to test a range of hypothetical flight times and a precautionary assessment for collisions risk was taken.

Section 7.4.7 provides the assessment of cumulative effect and notes that there are unavoidable limitations when comparing ornithological data and impact assessments across the range of projects that were scoped in for assessment. Limitation arise for older, permitted developments that have not yet been constructed and the associated ornithological data/assessments are dated. This was the case for a number of permitted solar and wind farm developments included in the assessment of cumulative effects. Overall it is considered that any significant limitations, in this regard, have been identified and adequately accounted for through the application of professional judgement, based on the information available including the desk study and wider area surveys conducted for the Proposed Project, and therefore robust conclusions on cumulative effects have been reached.

Table 7-2: Geographic frame of reference

Source: NRA (2009) – Adapted to define scales of ornithological importance

Description
International importance • Special Protection Area (SPA) within the zone of influence. • Resident or regularly occurring populations (assessed to be important at the national level) of a bird species, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive. • Resident or regularly occurring bird population occurring in numbers qualifying as important in a European context, i.e. occurring in numbers meeting 1% thresholds for international importance. • Features essential to maintaining the coherence of the Natura 2000 Network. • Other ornithologically important sites or populations associated with these sites occurring within the zone of influence, including: - Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971) within the zone of influence. - Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). - Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
National importance • Bird populations of importance in a national context, including any site designated or proposed as a Natural Heritage Area (NHA), Statutory Nature Reserve, Refuge for Fauna and Flora protected under the Wildlife Acts and/or National Park. This also includes any undesignated site fulfilling the criteria for designation as any of the aforementioned sites. • Resident or regularly occurring populations (assessed to be important at the national level) of bird species, - protected under the Wildlife Acts; and/or - that are red listed species (Gilbert et al., 2021). Typically, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.
County (regional) importance • Resident or regularly occurring populations (assessed to be important at the county level) of bird species, - listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - protected under the Wildlife Acts; and/or - that are red listed (Gilbert et al., 2021). • County important populations of species identified in the National or Local Biodiversity Action Plans (BAP), if this has been prepared. • Sites containing bird species that are rare or are undergoing a decline in quality or extent at a national level.
Local (higher value) importance • Locally important populations of priority species identified in the Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value. • Resident or regularly occurring populations (assessed to be important at the local level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list.
Local (lower value) importance • Habitats and species populations of less than local importance but of some value; and • Sites or features containing non-native species with some importance in maintaining habitat links

Table 7-3: Description of effects

Source: EPA (2022)

	Term	Description
Quality of Effects	Positive Effects	A change which improves the quality of the environment
	Neutral Effects	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative/adverse Effects	A change which reduces the quality of the environment
Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequence
	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
	Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
	Significant Effects	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 alters most of a sensitive aspect of the environment
	Profound Effects	An impact which obliterates sensitive characteristics
Extent and Context of Effects	Extent	Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
	Context	Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Probability of Effects	Likely Effects	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration and frequency of Effect	Momentary Effects	Effects lasting from seconds to minutes
	Brief Effects	Effects lasting less than a day
	Temporary Effects	Effects lasting less than a year
	Short-term Effects	Effects lasting one to seven years
	Medium-term Effects	Effects lasting seven to fifteen years
	Long-term Effects	Effects lasting fifteen to sixty years
	Permanent Effects	Effects lasting over sixty years
	Reversible Effects	Effects than can be undone e.g. through remediation or restoration
	Frequency of Effects	How often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Types of Effects	Indirect Effects (secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects	The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.
	'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.
	'Worst case' Effects	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
	Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents.

Table 7-4: Determining factors of avian sensitivity (conservation importance)

Source: Percival (2003)

Sensitivity	Definition
Very High	• Species that form the cited interest of Special Protection Areas (SPAs) & other statutorily protected nature conservation areas.
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: divers, common scoter, hen harrier, golden eagle, red-necked phalarope, roseate tern & chough. • Species present in nationally important numbers (>1% Irish population).
Medium	• Species on Annex 1 of the EC Birds Directive. • Species present in regionally important numbers (>1% regional (county) population). • Other species on the BirdWatch Ireland's red list of Birds of Conservation Concern (that are not already included in a category above).
Low	• Any other species of conservation interest, including species on the BirdWatch Ireland's amber list of Bird of Conservation Concern not covered above.

Table 7-5: Determining factors for behavioural sensitivity

Source: Percival (2003)

Behavioural sensitivity	Definition
High	• Species or populations occupying habitats remote from human activities, or that exhibit strong and long-lasting reactions to disturbance events (guide: >20 minutes).
Moderate	• Species or populations that appear to be warily tolerant of human activities or exhibit short-term reactions to disturbance events (guide: 5-20 minutes).
Low	• Species or populations occupying areas subject to frequent human activity and exhibiting mild and brief reaction (including flushing behaviour) to disturbance events.

Table 7-6: Scales of spatial magnitude

Source: Percival (2003)

Sensitivity	Definition
Very High	• Total or near total loss of a bird population due to mortality or displacement or reduced productivity in a bird population due to disturbance. • Guide: >80% of population affected
High	• Major reduction in the size or productivity of a bird population due to mortality, displacement or disturbance. • Guide: 21-80% of population affected
Moderate	• Partial reduction in the size or productivity of a bird population due to mortality, displacement or disturbance. • Guide: 6-20% of population affected
Low	• Small but discernible reduction in the size or productivity of a bird population due to mortality, displacement or disturbance. • Guide: 1-5% of population affected
Negligible	• Very slight reduction in the size or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation. • Guide: < 1% population affected

Table 7-7: Significance matrix: Combines effect magnitude & conservation importance of receptors

Source: Percival (2003)

Significance		Conservation Importance			
		Very High	High	Medium	Low
Magnitude	Very High	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Moderate	Very High	High	Low	Very low
	Low	Medium	Low	Low	Very low
	Negligible	Not significant	Not significant	Not significant	Not significant

7.3 Baseline Environment

7.3.1 Site Location and Description

The Proposed Project includes a 10-turbine wind farm site, with associated access tracks, cabling and other infrastructure including an on-site 110kV electrical substation is located in Co. Tipperary and lies within the townlands of Brittas, Rossestown, Clobanna, Brownstown, Kilkillahara and Killeenleigh, approximately 3 km north of Thurles town and centred on Irish National Grid Reference: S 13463 62522. The Proposed Project also includes a turbine delivery route (TDR) and a grid connection route (GCR). The TDR runs from the Port of Foynes in Co. Limerick to the Proposed Project Site via the national, regional and local road network. The GCR exits the proposed wind farm site from the on-site electrical substation in the northeast and runs south for approximately 7 km, following the public road to the existing Thurles 110kV electrical substation, located in the townland of Ballygammane, Co. Tipperary.

The ornithological study focused on the area of the Proposed Project Site and a range of study areas were applied depending on the different aspects of avian ecology being investigated; with the aim of identifying the occurrence, status and distribution of any sensitive bird species potentially affected by collision risk, disturbance and displacement due to the Proposed Project.

The River Suir flows in a southerly direction through the Proposed Project Site and the associated floodplain, although relatively constrained by rising ground and only flooding periodically, does provide a range of wetland habitats, with some areas retaining natural and semi-natural vegetation types. The banks along this section of the River Suir have been modified, with much of the river's floodplain converted to improved agricultural grasslands that are heavily drained. Improved agricultural grassland is the dominant habitat within the Proposed Project Site, which largely supports beef and some dairy production. The northwestern part of the Proposed Project Site includes an area of particularly intensively managed grassland. Other activities occurring within the Proposed Project Site include shooting of wildfowl along the banks of the River Suir. In the southern part of the Proposed Project Site, blocks of coniferous and broadleaf plantations, are a more prominent feature adjacent to the agricultural grasslands. These plantations support some older veteran and specimen trees that are vestiges of old treelines, parkland and woodland planted for game cover. There is a network of treelines and hedgerows through the Proposed Project Site providing nesting and foraging opportunities for birds, as well as connectivity through the area.

7.3.2 Designated Sites

Appendix 7A: Section 7A.2.2 provides the full screening assessment of sites designated for ornithological receptors with the potential to be ecologically linked to the Proposed Project Site, which for European Sites mirrors the findings of the Appropriate Assessment screening report and the conclusion of the Natura Impact Statement (NIS) for the Proposed Project. This assessment found that the Proposed Project Site, including the grid connection route is not located within or adjacent to any sites designated for an ornithological interest. Based on geographical separation and the core ranges of species listed in SNH (2016), there are no SPAs or Ramsar sites within the Zone of Influence of the Proposed Project Site. There is also no downstream hydrological connectivity between the Proposed Project Site and any SPA or Ramsar sites. Therefore, it can be conclusively determined that there is no potential for possible or likely significant effects on any SPAs. Likewise, there is no potential for negative effects to any Ramsar sites.

The only nationally important site in the vicinity of the Proposed Project Site with an ornithological interest is the Cabragh Wetlands pNHA [Site Code: 001934]. This pNHA is split between two subsites that are approximately 5 km apart. The closest part of the pNHA to the Proposed Project Site, known as the Tank wetland, is between 0.9 km and 4 km away and is located north of Thurles, between the Racecourse Road and the Dublin–Cork main line railway. The main ecological features of interest for this subsite are not ornithological and pertain to the floristic communities associated with wetland habitats fed by springs releasing lime-rich groundwater. This subsite does not carry any other designation, and this part of the catchment is not hydrologically linked to the Proposed Project Site. Therefore due to the lack of a source-pathway-receptor linkage between the features of interest and the area of the Proposed Project, no potential for possible or likely significant effects on this part of the Cabragh Wetlands pNHA are anticipated.

The other section of the Cabragh Wetlands pNHA, often referred to as the Cabragh Marshes, is located to the south of Thurles, and is between 6.5 km and 9.3 km from the Proposed Project Site and is within the northern extent of the Lower River Suir SAC. This wetland pNHA has been assessed as supporting a regionally important assemblage of wintering waterbirds, with numbers historically reported as regularly exceeding 1,000 birds, including a number of red listed species (Muyllaert, 2006, Collins, 2017 and Lauder, 2020). Although primarily noted as important for surface feeding ducks, including gadwall, mallard, pintail, shoveler, teal and wigeon, sizeable flocks of several wader species are noted as periodically occurring at Cabragh Marshes. This includes curlew (310), golden plover (2,000) and lapwing (2,100). Lauder (2020) suggests that as these wader flocks tend to range widely over farmland habitats, they utilise the Cabragh Marshes part of the pNHA as a safe daytime loafing site and that utilisation, especially for lapwing and golden plover, is dependent on water levels and land use in the surrounding area. Given the ranging tendencies of these species it is possible that curlew, golden plover and lapwing utilising the pNHA could also utilise suitable habitat within or adjacent to the Proposed Project Site.

A review of the occurrence of migratory geese and swans found that whooper swans and greylag geese only occur periodically, in small numbers and therefore are not considered regularly occurring populations. In addition, the greylag geese flocks occasionally utilising the area are likely to be part of the feral population, given the prevalence of feral flocks along the middle part of the River Suir catchment (Burke et al. 2022). Feral greylag geese are listed as an invasive species on the Third Schedule of EC (Birds and Natural Habitats) Regulations 2011.

In conclusion the only designated site where potential source-pathway-receptor linkages were identified between the Proposed Project Site and avian features of interest was for the southern part of the Cabragh Wetlands pNHA. The Proposed Project Site and the Cabragh Wetlands (southern section) are considered likely to contribute, along with several other locations, to supporting a relatively mobile wintering waterbird population of county (regional) importance, and in particular mobile flocks of lapwing and golden plover. Periodic or opportunistic patterns of waterbird usage for both the Proposed Project Site and the Cabragh Wetlands pNHA are evident and it is likely that birds utilise a number of alternative areas in the region, depending on conditions such as water levels and agricultural activities. Therefore, neither area appears to be singularly critically important to support the ranging flocks of lapwing and golden plover.

7.3.3 Ornithological baseline - summary

The ornithological baseline provided in **Appendix 7A** Section 7A.5 is repeated in the following sections and provides the baseline accounts for species occurrence in relation to the Proposed Project Site. The baseline accounts assimilate all the ornithological information collected for target species and avian assemblages over three years of surveying, spanning the period October 2020 to September 2023, with additional location specific surveys conducted over the breeding season 2024 and habitat suitability assessments conducted in February 2024. Where required the findings from the desk study are included.

The desk study and ornithological baselines provided in Appendix 7A include detailed information assessing species-specific potential for connectivity between Proposed Project Site and sites designated for ornithological features. To avoid excessive duplication, this assessment has not been carried through into the baseline species accounts presented in this chapter; as overall it was concluded, on the basis of separation distances, that the Proposed Project is not within the zone of influence for any site designated for ornithological features, with the exception of the southern part of the Cabragh Wetland pNHA. This assessment is covered in Section 7.3.2.

Results for each survey type are presented in Appendix 7A: Section 7A.4 and are not repeated within the chapter, apart from two tables summarising flight time recorded for target species within the 500 m proposed turbine buffer (Table 7-8) and predicted collision risk (Table 7-9). Baseline species accounts summarises the results and are supported by a number of appendices, including:

- Appendix 7E - provides the flight line maps for target species recorded during VP watches, which can be cross-referenced with tabulated data for each flight line;
- Appendix 7F - provides maps showing the distribution of breeding birds;
- Appendix 7G - provides territory mapping for breeding raptors and waders
- Appendix 7H - provides the Collision Risk Modelling (CRM) report

The baseline study allows for the identification of avian features associated with the Proposed Project Site that are Important Ecological Features (IEFs), which includes regularly occurring population of birds. In summary the ornithological baseline study identifies the following IEFs:

7.3.3.1 Wintering waterbird assemblage

The River Suir and associated floodplain within the 500 m proposed turbine buffer is part of a wetland that regularly supports numbers of county (regional) importance for eight species of wintering waterbird, including:

- three red listed species: golden plover, lapwing and snipe;
- three amber listed species: black-headed gull, cormorant and lesser black-backed gull; and,
- two green listed species: grey heron and little egret.

The wetland also regularly supports numbers of local (high value) importance for five species of wintering waterbird, including:

- three amber listed species: mallard, mute swan and teal; and,
- two green listed species: jack snipe, woodcock (wintering population only).

Several species were found to utilise the wetland relatively infrequently and therefore while numbers periodically recorded exceeded 1% thresholds, utilisation was not regular enough to be fully considered as populations of county or local importance. This included curlew, kingfisher, shoveler, whooper swan and wigeon.

Very infrequent occurrence was noted for a further seven waterbird species, including common gull, dunlin, great black-backed gull, greylag goose, green sandpiper, herring gull and whimbrel. For these species, based on frequency of utilisation and relatively small numbers being recorded, it can be objectively concluded that this area is not important for these species and therefore the Proposed Project does not pose any significant population level risks. On this basis these species do not need to be carried forwarded into the ornithological impact assessment, as they are not IEFs for the Proposed Project.

7.3.3.2 Breeding waterbirds

Three waterbird species were recorded breeding within the Proposed Project Site including lapwing (5-6 pairs), snipe (6 territories) and mute swan (1 pair), with population assessments identifying that Proposed Project Site supports nationally, regionally (county) and locally important breeding populations of these species, respectively.

Two additional waterbird species were identified as potentially breeding which included mallard and teal. The section of the River Suir within the Proposed Project Site is assessed as being of county importance for being within the territory of 1, possibly 2 pairs of kingfishers.

7.3.3.3 Birds of prey

The baseline study recorded nine birds of prey, with six species considered to be regularly occurring within the 2 km proposed turbine buffer, including:

- four resident green listed breeding species: sparrowhawk (2-3 pairs), buzzard (3 pairs) and long-eared owl (1 pair) assessed as locally important, and peregrine (1 pair) assessed as regionally (county) important; and,
- two resident red listed breeding species: kestrel (1-2 pairs) and barn owl (1 pair), both assessed as regionally (county) important.

Based on exceptionally low recorded usage over a three year period, no likely significant effects are anticipated, and no further impact assessment is required for three birds of prey that were only recorded over the winter, including hen harrier (2 observations), merlin (observed on 6 dates) and short-eared owl (1 observation).

7.3.3.4 Other species

Other red listed non-passerines that were recorded included foraging swift (up to 25 birds) assessed as regionally (county) important and possibly breeding stock dove (1 pair) assessed as locally important.

Regularly occurring red listed and amber listed passerines were all assessed as locally important, this included the following breeding species, which are notably due to the habitat association:

- Ground nesting species, including: meadow pipit and skylark;
- Riverine species, including: grey wagtail;
- Farmland birds - hedgerow nesting, including: yellowhammer;
- Scrub nesting species, including: linnets and willow warbler; and,
- Hedgerow and woodland species, including: goldcrest and spotted flycatcher.

7.3.3.5 Collision risk modelling

Collision risk modelling as detailed in Appendix 7H, identified eight species where predicted collision risk was 1 or more collision over the 35 year operational period for the Proposed Project, including: buzzard, cormorant, golden plover, grey heron, kestrel, lapwing, lesser black-backed gull and little egret. A hypothetical CRM was run for swift, as the unfavourable conservation status of this species was only recently upgraded to red (Gilbert et al. 2021) and it then became considered as a target species for flight line data. Indicative modelling was undertaken for swift applying a range of flight seconds to examine hypothetical collision risk for this species, which utilising the lowest and medium amount of flight seconds, suggested that predicted collision risk was between 3 and 293 collisions over 35 years.

Applying the default avoidance rates for lapwing and golden plover resulted in over-inflated predicted collision risk and avoidance rate was increased within the CRMs to test this variable.

The CRMs generated notably low levels of theoretical collision risk for four of the 12 target species analysed, including: black-headed gull, peregrine, snipe and sparrowhawk. As part of the assessment, further consideration was given to collision risk for snipe and sparrowhawk, as CRMs are noted as unreliable for these species, due to potential for under recording of flight times. In spite of the CRM for peregrine generating low predicted collision

risk, in view of a breeding site in relatively close proximity to the proposed turbines, as a precaution collision risk was assessed in the context of young birds fledging in an area adjacent turbines.

As detailed in the baseline accounts for each species, assessment of potential population level effects due predicted collision risk found that:

- For buzzard predicted collision risk is anticipated to have likely significant effects on the local breeding population, with recently fledged birds identified as being particularly at risk. The application of default avoidance (98%) in the CRM, while precautionary, acknowledges the susceptibility of buzzards to colliding with turbines and is considered to accurately represent the risk based on recorded flight activity. Predicted collision risk was broadly in line with the results of post-construction collision monitoring studies. The magnitude of effect for any turbine mediated mortality, additional to background levels, is assessed precautionarily as a moderate: 6-20% effect (Percival, 2003) on the regional buzzard population, which in the context of an expanding population, will see birds readily recruit into the local area and replace any birds occasionally lost to turbine mediated mortality.
- For cormorant, grey heron and little egret modelled outputs predicted one or close to one collision over the 35 years. In the context grey heron and little egret having favourable (green listed) conservation status and the cormorant population not considered threatened at this location, these relatively low levels of predicted collision risk are considered unlikely to have any significant (> 1%) population level effects.
- For kestrel predicted collision risk is anticipated to have a moderate: 6-20% effect (Percival, 2003) on the local breeding population.
- For wintering lapwing the worst-case scenario for predicted collision risk, i.e. applying 98% default avoidance, indicates that any population level effects would be expressed at the local population level and the magnitude of effect is assessed low: 1-5% (Percival, 2003) for the local breeding population and moderate: 6-20% (Percival, 2003) if assessed with the wintering population. Magnitude of effect is moderated by increasing the avoidance rate to 0.995, which is a more realistic yet still precautionary rate as justified in the species account (Section 7.3.4.8).
- For wintering golden plover the worst-case scenario for predicted collision risk, i.e. applying 98% default avoidance, indicates that any population level effects would be expressed at the county and local population level and the magnitude of effect is assessed low: 1-5% and high: 21-80%, respectively (Percival, 2003). Magnitude of effect is moderated by increasing the avoidance rate to 0.995, which is a more realistic yet still precautionary rate as justified in the species account (Section 7.3.4.9).
- For lesser black-backed gull the worst-case scenario for predicted collision risk, (0.64 collisions/year), indicates that any population level effects would be expressed at the county population level and the magnitude of effect is anticipated to be low: 1-5% (Percival, 2003).
- For swift, based on the hypothetical flight times applied within the CRM, as detailed in the species account (Section 7.3.6.1), taking the middle scenario for flight time indicates that there is potential for moderate: 6-20% (Percival, 2003) population level effects on the regional swift population.

7.3.3.6 Summary of results

A summary of results of VP watches and outputs from collision risk models are provided in Table 7-8 and Table 7-9, respectively. Only predicted collision risk outputs run for Turbine Type B are presented in Table 7-9, as this turbine type was found to result in marginally higher levels of collision risk.

Table 7-8: Target species flight time recorded within the 500 m proposed turbine buffer

- Aggregated flight seconds is derived from the sum of all the observed flights, where flight time (seconds) is multiplied by the number of birds recorded for each observation
- Values in **Bold** in Band B (CRZ: 25-180 m) indicate the flight seconds inputted into the collision risk model (CRM)
- Values in Green in Band B (CRZ: 25-180 m) indicate that although flight seconds were > 200 secs, CRMs were not run for these species, as the number of flight observations generating the flight time was notably low - only one to three observations at collision risk height recorded over the two-year study period

Target species BoCCI (Gilbert et al., 2021) Red, Amber & Green listed *Species listed on Annex I	No. of obs.	No of bird		Aggregated flight secs in the 500 m proposed turbine buffer		
		Min	Max	Band A < 25 m	Band B 25-180 m (CRZ)	Band C >180 m
Black-headed gull	6	2	22	1,190	**1,035**	-
Buzzard	193	1	4	2,613	**41,192**	1,149
Common gull	2	1	2	43	70	-
Cormorant	33	1	3	855	**989**	-
Dunlin*	1	16	16	-	**720**	-
Golden plover*	42	3	400	10,100	**719,967**	-
Green sandpiper	1	1	1	11	-	-
Grey heron	54	1	3	1,226	**1,306**	-
Greylag goose	1	1	1	10	-	-
Hen harrier*	1	1	1	89	-	-
Kestrel	83	1	1	2,077	**5,225**	-
Lapwing	153	1	200	50,258	**531,730**	
Lesser black-backed gull	53	1	70	4,661	**52,161**	715
Little egret*	48	1	5	1,960	**721**	-
Mallard	16	1	60	3,047	**431**	-
Mute swan	11	1	9	620	**1,080**	-
Peregrine*	9	1	1	43	**1,107**	-
Snipe	13	1	7	662	**480**	-
Sparrowhawk	7	1	1	53	**785**	-
Swift	6	2	25	324,040	1,575	-
Whimbrel	2	3	3	174	157	-
Whooper swan*	1	2	2	Foraging	-	-
Wigeon	1	22	22	-	**2,420**	-

Table 7-9: Predicted collision risk for target species, as per CRMs run for Turbine Type B

- CRMs results inputting rotational period 6.85, pitch 6° and flight time in CRZ 25-180m
- Results in **Bold** indicate that predicted collision risk exceeds 1 collision over 35 years
- Note: Outputs from multiple CRMs provided for golden plover and lapwing to highlight effect of avoidance rates
- Note: Outputs for lesser black-backed gull show results for two years data and also Year 1 (Oct-21 to Sep-22), which had substantially higher flight activity

Species	Season	Avoidance * default	Collisions			Equivalent to 1 collision every x years
			per year	per decade	per 35 years	
Black-headed gull	Year-round	99.2%	0.008	0.08	0.3	128.2
Buzzard	**Year-round**	98.0%*	0.861	8.61	**30.1**	1.2
Cormorant	**Year-round**	98.0%*	0.032	0.32	**1.1**	31.2
Golden plover	**Wintering + April passage**	98.0%*	17.104	171.04	**568.6**	0.1
		99.5%	4.276	42.76	**149.7**	0.2
		99.8%	1.710	17.10	**59.9**	0.6
		99.9%	0.855	8.55	**29.9**	1.2
		99.99%	0.153	1.53	**3.0**	11.7
Grey heron	**Year-round**	98.0%*	0.036	0.36	**1.3**	27.6
Kestrel	**Year-round**	95.0%	0.210	2.10	**7.3**	4.8
Lapwing	**Year-round**	98.0%*	10.022	100.22	**350.8**	0.1
		99.5%	2.510	25.10	**87.7**	0.4
		99.8%	1.000	10.00	**35.1**	1.0
		99.9%	0.500	5.00	**17.5**	2.0
		99.99%	0.050	0.50	**7.3**	4.8
	Breeding 2023	98.0%*	0.122	1.22	**4.3**	8.2
		99.2%	0.049	0.49	**1.7**	20.5
		99.5%	0.030	0.30	**1.1**	32.8
		99.8%	0.012	0.12	0.4	82.0
	Winter 2022-23	98.0%*	12.137	121.37	**424.8**	0.1
		99.2%	4.855	48.55	**169.9**	0.2
		99.5%	3.034	30.34	**106.2**	0.3
		99.8%	1.214	12.14	**42.5**	0.8
Lesser black-backed gull	**Both years**	99.5%	0.314	3.14	**11.0**	3.2
	Year 1 only	99.5%	0.640	6.40	**22.4**	1.6
Little egret	**Year-round**	98.0%*	0.027	0.27	**1.0**	36.5
Peregrine	Year-round	98.0%*	0.022	0.22	0.8	44.8
Snipe	Wintering + Apr	98.0%*	0.011	0.11	0.4	93.2
	Winter + Apr + 25% night flights	98.0%*	0.013	0.13	0.5	74.1
Sparrowhawk	Year-round	98.0%*	0.012	0.12	0.4	81.5

Avoidance rates form SNH (2018a), update rates for gulls based on Furness (2019)
*Species for which there is no species specific avoidance rate available and default avoidance at 98% has been applied, as suggested by SNH (2018a). Higher avoidance rates are likely to be more appropriate for most species.

7.3.4 Wetland birds - baseline species accounts

The following waterbird species were recorded utilising or flying through the 500 m proposed turbine buffer or in close vicinity to the Proposed Project Site:

Swans, geese and ducks

- Greylag goose, mute swan, whooper swan, shoveler, wigeon mallard & teal

Waders

- Lapwing, golden plover, curlew, whimbrel, dunlin, snipe, jack snipe, woodcock & green sandpiper

Gulls

- Black-headed gull, common gull, great black-backed gull and herring gull

Other waterbirds

- Cormorant, grey heron, little egret, kingfisher

7.3.4.1 Species account: Greylag goose

During VP watches the only record for greylag goose was a single bird flying through the 500 m proposed turbine buffer at *c*. 15 m on 31 November 2021. No CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for greylag goose is assessed as negligible. Based on I-WeBS counts and wider area wintering waterbird surveys (winters 2020/21, 2021/22, 2022/23), greylag geese have only been recorded within the Proposed Project Site in one season since winter 2011/12, with a maximum count of 2 birds.

The desk study and wider area wintering waterbird surveys, show that usage of the hinterland by this species is infrequent, with counts never exceeding nationally important numbers (1% threshold: 35 birds). The closest occasionally occurring flock to the Proposed Project Site is recorded at the Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km from the Proposed Project, where numbers over the last 10 years have not exceeded 20 birds. The provenance of the flocks occurring, feral or Icelandic, is unknown and it is likely that at least some of the records, if not all, relate to the feral population. The feral greylag goose population in Ireland is listed on the Third Schedule of EC (Birds and Natural Habitats) Regulations 2011, as an invasive species.

Therefore, it can be objectively concluded that the Proposed Project is not important for this species and there is no potential for any likely significant effect on the migratory Icelandic greylag goose population wintering in Ireland. On this basis this species does not need to be carried forwarded into the ornithological impact assessment, as it is not an Important Ecological Feature.

7.3.4.2 Species account: Mute swan

During VP watches, 10 mute swan flights were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 9 birds. Flights occurred in all seasons, but activity was higher over the winter, which was associated with slightly more birds occurring in the general area during the winter months. Only one flight (9 birds) was recorded within the CRZ, equating to a total of 1,080 aggregated flight seconds. No regular flight paths between foraging and roosting locations were identified. As only a single flight occurred within the CRZ, no CRM was run for this species and no significant (> 1%) population level effects due to collision risk is anticipated for mute swan.

Based on I-WeBS counts and wider area wintering waterbird surveys (winters 2020/21, 2021/22, 2022/23), relatively small numbers of wintering mute swan (2-6 birds) are regularly recorded within the Proposed Project Site, with utilisation of the site associated with River Suir and adjacent floodplain. In addition to winter birds, a pair have been recorded breeding along the River Suir within the 500 m proposed turbine buffer.

The wintering population of mute swans recorded across the hinterland, out to 5 km, consists of equally small numbers which utilise most available wetland sites that have some open water. Cumulatively, wintering numbers within the 5 km proposed turbine buffer are estimated at less than 20 birds, which is below nationally/internationally important numbers (1% threshold: 90 birds). If assuming Co. Tipperary supports a mute swan population of 1,200 birds based on I-WeBS counts, the 1% threshold for county importance can be taken as 12 birds.

Based on the data presented, it can be objectively concluded that the Proposed Project Site is utilised by locally (higher value) important numbers of wintering mute swan. Likewise, taking 13-14 pairs as an informed estimate of the 1% threshold for national importance , then the pair utilising the Proposed Project Site is assessed as locally important.

7.3.4.3 Species account: Whooper swan

During VP watches the only record for whooper swan were two birds foraging in grassland, adjacent to the River Suir on 07 March 2022 and no flights were detected. No CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for whooper swan is assessed as highly unlikely to result in any significant (> 1%) population level effects. Over winters 2021/22 and 2022/23 there were no regular flight paths between roosts and foraging areas identified for whooper swan, and this species was not recorded during wider area surveys extending out to 5 km from the Proposed Project Site. Over winter 2020/21, a small flock (3-5 birds) was regularly recorded along the River Suir, just north of the 500 m proposed turbine buffer at Clonamuckoge Beg/Killkillahara. Based on I-WeBS data for the River Suir Upper count section, the area historically supported a flock of whooper swans, with annual peak counts ranging from 10 to 28 birds. However, apart from usage recorded over 2020/21, no birds have been recorded in the area since winter 2016/17.

Historic maximum counts are below the threshold for national importance (1% threshold: 150 birds). The most recent whooper swan population estimate for Co. Tipperary is 441 birds (Burke et al. 2021); therefore, based on a 1% threshold, a regularly occurring population of 4 or more birds is classed as being of county importance. A precautionary assessment, given the sporadic usage of the area by whooper swans in recent years, is that the Proposed Project Site occasionally supports numbers of county importance, however it is noted that birds are not regularly occurring.

7.3.4.4 Species account: Shoveler

The Cabragh Wetlands pNHA south of Thurles and approximately 6.5 km south of the Proposed Project Site is the closest wetland noted as historically supporting nationally important numbers of this species (1% threshold: 20 birds) – see Crowe (2005). During all the surveys covering the 500 m proposed turbine buffer, shoveler were only recorded once during winter site walkovers, with four birds recorded on 16 March 2023. These birds were utilising flood waters along the southern extent of the 500 m proposed turbine buffer. Therefore, it is considered that shovelers may occasionally utilise the Proposed Project Site when the River Suir is under certain flood conditions, with numbers likely to be lower than the requisite for national importance (1% threshold: 20 birds). A precautionary assessment, given the sporadic usage of the area by shovelers, is that the Proposed Project Site occasionally supports numbers of county importance; however, it is noted that birds are not regularly occurring.

7.3.4.5 Species account: Wigeon

During VP watches one wigeon flight consisting of 22 birds was recorded flying through the 500 m proposed turbine buffer on 29 December 2022 and was recorded flying within the CRZ at 40-50 m, with flight time equating to 2,420 aggregated flight seconds. As only a single flight was recorded no CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for wigeon is assessed as highly unlikely to result in any significant (> 1%) population level effects.

The only other record of wigeon in the vicinity of the Proposed Project Site was a flock of 80 birds recorded during a site walkover on 16 March 2023, when the flock was foraging in flooded fields directly east of the River Suir, just south of the 500 m proposed turbine buffer. These numbers are lower than the threshold for nationally important numbers (1% threshold: 560 birds).The baseline assessment for wigeon finds low levels of periodic usage for the Proposed Project Site, as recorded over three winters (2020/21, 2021/22, 2022/23), and this is supported by I-WeBS counts for the River Suir Upper, where small numbers of wigeon (2 to 10 birds) were only recorded in three out of nine of the most recent winters of monitoring.

In summary, wigeon are only occasionally recorded within the Proposed Project Site and based on the low numbers periodically recorded the site supports a population of local (higher value) importance. This assessment is precautionary as it is noted that wigeon are not regularly occurring.

7.3.4.6 Species account: Mallard

Mallards were found to be a regularly occurring wetland species within the Proposed Project Site during both the winter and breeding season. During VP watches a total of 16 flight observations were recorded within the 500 turbine buffer, with numbers recorded ranging from 1 to 60 birds and generating 3,478 aggregate flight seconds. However, only two flights were recorded at heights above 25 m, equating to 431 aggregate flight seconds within the CRZ. As only two flights were recorded within the CRZ, no CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for mallard is assessed as highly unlikely to result in any significant (> 1%) population level effects.

The numbers of mallard utilising or flying through the Proposed Project Site over the winter months was low, ranging from 1 to 6 birds across all the monitoring completed over three winters (2020/21, 2021/22, 2022/23), and this is supported by I-WeBS counts for the River Suir Upper, where small numbers of mallard (2 to 7 birds) were only recorded in two out of nine of the most recent winters of monitoring.

Mallard numbers over breeding season 2022 were low (1-2 birds), with higher numbers recorded over breeding season 2023, when on three dates counts of 12, 16 and 60 birds were recorded. Higher counts in 2023 were associated with flooding along the River Suir late in the season (July and August), when most young birds would be fully fledged and therefore mobile with potential to have moved away from natal sites. As a widespread breeding species in Ireland, it is likely that several mallards will nest within the Proposed Project Site. Based on an all-Ireland breeding population of 15,400 pairs (NPWS, 2019), the 1% threshold for national importance is estimated at 154 pairs.

In summary, mallard were only regularly recorded within the Proposed Project Site in low numbers and the site was assessed as supporting a population of locally (higher value) importance.

7.3.4.7 Species account: Teal

The highest numbers recorded during I-WeBS counts of the River Suir Upper count area covering the northern part of the Proposed Project Site is 50 birds, with teal recorded on five out of nine of the most recent winters of monitoring. This is below nationally important numbers (1% threshold: 360 birds). The closest nationally important wintering flock of teal to the Proposed Project Site is recorded at the Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km from the Proposed Project, where peak counts over the last 10 winters have ranged from 150 to 450 birds. Based on I-WeBS count data, a notional county/regional wintering teal population is estimated at 2,000 to 3,000 birds and the assumed 1% threshold for county importance can be taken as a regularly occurring population of 20-30 birds.

No teal flights within the 500 m proposed turbine buffer were recorded during VP watches. Typically, small numbers (1-4 birds) were recorded along the River Suir over the winter, with the highest numbers recorded in the small pond in the southern woodland where 26 birds were recorded on 21 January 2022, in addition to 7 birds

recorded along the river. An incidental record on 28 November 2022 recorded 120 teal along the River Suir, just south of the 500 m proposed turbine buffer and was associated with flooding.

No teal were recorded during the breeding season and Co. Tipperary has recorded some of the lowest breeding densities for teal in the country (Balmer et al., 2013). There were a small number of potentially suitable nesting sites noted, including the pond in the southern woodland and some of the denser vegetation associated with the River Suir floodplain.

In summary, taking a regularly occurring teal population of 4 birds, the Proposed Project Site is considered as supporting a wintering teal population of local (higher value) importance and has some potential to support a small number of breeding pairs. Higher numbers over the winter, exceeding 1% thresholds for county importance were only periodically recorded and was not considered as a regularly occurring population. The River Suir floodplain is relatively heavily hunted over the open season for duck species (September to January inclusive) and is likely to result in periodic displacement of birds over the winter.

7.3.4.8 Species account: Lapwing

Based on I-WeBS data for the count site covering the northern part of the Proposed Project Site (River Suir Upper), lapwings were recorded in seven out of nine of the most recent winters of monitoring, with peak counts ranging from 12 to 300 birds. Over the three winters covering the Proposed Project Site lapwing were recorded flying through the 500 m proposed turbine buffer in most winter months, with peak counts of 500 birds, 160 birds and 200 birds recorded over winters 2020/21, 2021/22 and 2022/23, respectively. These flocks of lapwing were often moving through the 500 m proposed turbine buffer, appearing to favour the area around Clonamuckoge Beg/Kilkillahara, which is just northwest of the 500 m proposed turbine buffer, as well as some flooded fields at Ballybristy/Clondoty, approximately 2.5 km further to the northwest. This was especially the case over winters 2020/21 and 2021/22, whereas over winter 2022/23 flight activity was more centred along the stretch of the River Suir north of the Rossestown Bridge. The change in flight activity between seasons was mirrored by golden plover usage of the area.

Numbers of wintering birds recorded did not exceed the 1% threshold for national importance (850 birds). Based on I-WeBS data the lapwing population for Co. Tipperary was estimated at 2,000 to 3,000 birds and applying a 1% threshold, the wintering population of lapwing occurring within the Proposed Project Site is classified as being of county importance, as an area regularly supporting more than 20-30 birds.

Lapwing were recorded breeding within the Proposed Project Site (Figure 7G.1 in Appendix 7G), and although it was difficult to differentiate between birds displaying on passage and genuine breeders, due to high failure rates it is estimated that there was a maximum of 6 pairs recorded. This is classed as nationally important based on an Irish breeding population estimate of 476 to 620 pairs (NPWS, 2019), i.e. 1% threshold of 4-6 pairs. As mentioned, breeding success was exceptionally low and in 2022 no birds were recorded after May indicating complete failure. Surveyors noted that site abandonment may have been related to active land management occurring in the area, as well as nest site depredation by hooded crows. In 2023, of the 5-6 pairs attempting to breed, only a single pair was recorded later in the season as potentially raising chicks. It is likely that implementing some basic habitat management measures, e.g. allowing some areas to develop longer, tussocky vegetation for nesting cover and controlling hooded crow numbers would have a positive effect on this population.

During VP watches 153 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 200 birds and generating 581,988 aggregate flight seconds. A high proportion of the flight time was recorded above 25 m and 531,730 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, several CRMs were run for lapwing to account for different seasonal usage of the 500 m proposed turbine buffer and also to test the effects of different avoidance rates on predicted collision risk.

Application of the default avoidance rate (0.98) is considered too low for lapwing and higher avoidance, closer to 99.8%, is consider more appropriate for this species.

Applying 98.0% default avoidance generates an output of 351 predicted collisions over 35 years and applying 99.8% avoidance results in 35 predicted collisions over 35 years. Running CRMs to examine differences in seasonal collision risk, finds that substantial reduced flight activity within the CRZ during the breeding season generated lower levels of collision risk, which emerges as negligible once avoidance is set to 99.5%, with outputs predicting 0.2 to 1.1 collisions over 35 years (Turbine Type B). The wide range between outputs was due to higher aggregate flight times recorded in the second breeding season (2023), which was reflective of a slightly more successful breeding season compared to the first breeding season (2022), when breeding attempts had failed by May and the site was abandoned early in the season.

The CRM run for the non-breeding seasons showed that lapwing flight activity over the winter drives higher collision risk, with winter 2022/23 resulting in the highest predicted collision risk. Estimated collisions over 35 years for each non-breeding season analysed ranges from:

- 166 to 425 collisions over 35 years with avoidance at 98.0%
- 29 to 106 collisions over 35 years with avoidance at 99.5%
- 12 to 43 collisions over 35 years with avoidance at 99.8%

Potential for predicted collision risk to have a > 1% population level effect above background mortality are tested by applying an annual adult survival rate of 0.71 (BTO BirdFacts[6]) to the all-Ireland lapwing wintering population of 84,690 birds (Lewis et al. 2019b), an estimated county/regional wintering population of 2,000-3,000 birds (estimated using I-WeBS data) and a local population of 200-500 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland population (84,690 birds) would require: 245 collisions per year
- County population (2000-3000 birds) would require: 5 to 8 collisions per year
- Local population (200-500 birds) would require: 0.5 to 1 collisions per year

Taking an intermediate modelled output for predicted annual lapwing collision risk of 2.51 collisions per annum (precautionary, 99.5% avoidance for Turbine Type B), any additional mortality due to predicted collision risk would have a less than 1% effect on the all-Ireland population (0.01%, excluding cumulative effects) and the county population (0.29-0.43%). In terms of the local lapwing population (200-500 birds) regularly utilising the Proposed Project Site over the winter, applying the intermediate modelled output for predicted lapwing collision risk, 2.51 collisions per annum, would express an effect > 1% above background mortality, ranging from 1.7 to 4.3% depending on the size of the local population assessed.

To test magnitude of effect on the lapwing breeding population, an annual adult survival rate of 0.71 (BTO BirdFacts[7]) is applied to the low and high all-Ireland lapwing breeding population estimates of 952 to 1,240 birds (NPWS, 2019), and the local breeding population of 12 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland breeding population high estimate (1,240 birds) would require: 4 collisions per year
- All-Ireland breeding population low estimate (952 birds) would require: 3 collisions per year
- Local breeding population (12 birds/6 pairs) would require: 0.03 collisions per year

[6] BTO BirdFacts – Lapwing: https://www.bto.org/understanding-birds/birdfacts/lapwing
[7] BTO BirdFacts – Lapwing: https://www.bto.org/understanding-birds/birdfacts/lapwing

Applying 0.03 collisions per annum for breeding season predicted collision risk, based on the intermediate output from the 2023 breeding season (precautionary, 99.5% avoidance for Turbine Type B), which accounts for highest levels of flight activity recorded over the study period, would express an effect very close to 1% of background mortality.

In summary, the Proposed Project Site supports nationally important numbers of breeding lapwing, all be it a struggling one, and a wintering population that is classed as regionally (county) important. The outputs from CRMs, assessed at an intermediate avoidance rate (0.995), indicate that predicted collision risk over the breeding season has the potential for low level (*c.* 1%) effects on the lapwing breeding in the area. Similarly for wintering lapwing applying intermediate outputs for predicted collision risk (99.5% avoidance) indicates that any population level effects would be expressed at the local population level and the magnitude of effect is anticipated to be low (1-5%).

7.3.4.9 Species account: Golden plover

Based on I-WeBS data for the count site covering the northern part of the Proposed Project Site (River Suir Upper), golden plover were recorded in two out of nine of the most recent winters of monitoring, with peak counts ranging from 1 to 4 birds. Over the three winters covering the Proposed Project Site golden plovers were recorded flying through the 500 m proposed turbine buffer in most winter months, with peak counts of 700 birds, 200 birds and 400 birds recorded over winters 2020/21, 2021/22 and 2022/23, respectively. These flocks of golden plover were often moving through the 500 m proposed turbine buffer, appearing to favour the area around Clonamuckoge Beg/Kilkillahara, which is just northwest of the 500 m proposed turbine buffer, as well as some flooded fields at Ballybristy, approximately 2.5 km further to the northwest. This was especially the case over winters 2020/21 and 2021/22, whereas over winter 2022/23 flight activity was more centred along the stretch of the River Suir north of the Rossestown Bridge. The change in flight activity was mirrored by lapwing usage of the area.

Numbers of wintering birds recorded did not exceed the 1% threshold for national importance (920 birds). Based on I-WeBS data the golden plover population for Co. Tipperary was estimated at 3,000 to 5,000 birds and applying a 1% threshold, the wintering population of golden plover occurring within the Proposed Project Site is classified as being of county importance, as an area regularly supporting more than 30-50 birds. Golden plover usage of the Proposed Project Site did not extend beyond April and there is no suitable breeding habitat for this species, which has an Irish breeding range that is restricted to the uplands of the mid-west and northwest (Sharrock, 1976, Hutchinson, 1989, Gibbons et al., 1993, Balmer et al. 2013).

During VP watches 42 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 3 to 400 birds and generating 730,067 aggregate flight seconds. A high proportion of the flight time was recorded above 25 m and 719,967 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, several CRMs were run for golden plover to test the effects of different avoidance rates on predicted collision risk. Application of the default avoidance rate (0.98) is considered too low for golden plover and higher avoidance, closer to 99.8%, is considered more appropriate for this species.

Applying 98.0% default avoidance results in 30 predicted collisions over 35 years and applying 99.8% avoidance results in 3 predicted collisions over 35 years. Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.73 (BTO BirdFacts[8]) to the all-Ireland golden plover wintering population of 92,060 birds (Lewis et al. 2019b), an estimated county/regional wintering population of 3,000-5,000 birds (estimated using I-WeBS data) and a local population of 200-700 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

[8] BTO BirdFacts – Golden plover: https://www.bto.org/understanding-birds/birdfacts/golden-plover

- All-Ireland population (92,060 birds) would require: 248 collisions per year
- County population (3,000-5,000 birds) would require: 8 to 13 collisions per year
- Local population (200-700 birds) would require: 0.5 to 2 collisions per year

Taking an intermediate modelled output for predicted annual golden plover collision risk of 4.28 collisions per annum (precautionary, 99.5% avoidance for Turbine Type B), any additional mortality due to predicted collision risk would have a less than 1% effect on the all-Ireland population (0.02%, excluding cumulative effects) and the county population (0.3-0.5%). In terms of the local golden plover population (200-700 birds) regularly utilising the Proposed Project Site over the winter, applying the intermediate modelled output for predicted golden plover collision risk, 4.28 collisions per annum, would express an effect > 1% above background mortality, ranging from 2.3 to 7.9% depending on the size of the local population assessed.

In summary, the proposed Wind Farm Site supports a wintering golden plover population that is classed as regionally (county) important. The outputs from CRMs, assessed at an intermediate avoidance rate (0.995) indicate that collision risk has the potential for low to moderate level effects (2 to 8%) on the golden plover population wintering in the area.

7.3.4.10 Species account: Curlew

Based on I-WeBS data (2011/12 to 2020/21) for the count site covering the northern part of the Proposed Project Site (River Suir Upper), curlew were recorded in four out of nine of the most recent winters of monitoring, with peak counts ranging from 1 to 30 birds. Even for previous monitoring periods peak count remained below 100 birds, with Crowe (2005) reporting a peak count of 88 birds for this I-WeBS count site for winters 1996/97 to 2000/01. A flock of up to 200 birds is more regularly recorded at the Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km from the Proposed Project Site. This wintering population falls below the 1% threshold (350 birds) for consideration as nationally important but qualifies as being of county importance.

Over the three winters covering the Proposed Project Site (2020/21, 2021/22 and 2022/23) only a single curlew was recorded flying within the 500 m proposed turbine buffer during a winter site walkover in February 2022. The only other curlew observations in the vicinity of the Proposed Project Site were two flight records from VP watches, both of single birds flying outside the 500 m proposed turbine buffer over the summer, including:

- 10 August 2021: 1 bird flying south, *c.* 1 km from the Proposed Project Site close to VP3
- 09 June 2023: 1 bird flying south, *c.* 2 km from the Proposed Project Site east of VP1

Although recorded during the breeding season, no breeding behaviour was associated with these two observations and birds were noted as commuting through the area. There were no breeding curlew encountered within the 2 km of the Proposed Project Site and the closest documented breeding sites are over 10 km away to the southeast and over 20 km away to the west (O'Donoghue *et al*., 2019, Fehily Timoney, 2022, Colhoun et al., 2022).

Therefore, in summary based on sporadic recorded usage of the River Suir Upper I-WeBS count site by wintering curlew since 2011/12 and the near lack of usage over the study period, it can be objectively concluded on a precautionary basis that the Proposed Project Site is only very occasionally utilised by curlew in numbers of county importance over the winter and there is no contemporary breeding population associated with this area.

7.3.4.11 Species account: Whimbrel

Whimbrel do not breed in Ireland, they are spring and autumn passage migrants, with very limited numbers over wintering (Lewis et al., 2019b). Much of the movement of birds on spring passage happens along the coast and inland records in the likes of Co. Tipperary are less common. A small number of whimbrel were recorded on

autumn passage commuting through the Proposed Project Site. Three birds were observed on 09 August 2023 and 157 aggregate flight seconds were recorded within the 500 m proposed turbine buffer and at collision risk height (> 25 m). The low level of flight activity did not warrant a CRM, and it is considered highly unlikely that the Proposed Project poses any significant population level risks to whimbrel, which have a favourable (green listed) conservation status in Ireland (Gilbert et al., 2021).

Therefore, on the basis of exceptionally low usage of the Proposed Project Site, whimbrel can be excluded as an IEF and do not require any further assessment. Based on the species' favourable conservation status it can be objectivity concluded that the Proposed Project will not result in any likely significant effects for whimbrel.

7.3.4.12 Species account: Dunlin

Dunlin do not breed in this region (Sharrock, 1976, Gibbons et al., 1993, and Balmer et al. 2013) and this species is predominately coastal over the winter and is only regularly recorded at a small number of inland I-WeBS sites (Lewis et al., 2019b). Based on I-WeBS data for the count site covering the northern part of the Proposed Project Site (River Suir Upper), dunlin were recorded in one out of nine of the most recent winters of monitoring, with a peak count of 3 birds. The I-WeBS counts for the Carbragh Wetland site show similarly low levels of limited usage and these counts indicate that this species does not regularly occur in this region over the winter.

There was only one observation of dunlin, which was recorded during VP watch on 29 December 2022, when 16 birds were observed flying for 720 seconds within the 500 m proposed turbine buffer at 30-40 m. As only a single flight was recorded no CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for dunlin is assessed as negligible. It is considered highly unlikely that the Proposed Project poses any significant (> 1%) population level risks to this species.

Therefore, dunlin are not considered as an IEF and can be scoped out for further ornithological impact assessment, as exceptionally low levels of occurrence means the potential for any likely significant effects for this species can be precluded.

7.3.4.13 Species account: Snipe

It is difficult to effectively count this cryptic species over the winter, as birds tend to spend the majority of the day hidden away in long vegetation, only becoming visible in flight, typically when flushed or at dusk/dawn when commuting between roosting and foraging areas or on spring/autumn passage when more cohesive flocks are often observed. Due to the difficulty in counting snipe no population estimate for the number of snipe wintering in Ireland is given in Lewis et al. (2019b), and therefore, there is no robust 1% threshold for national importance; although previous I-WeBS reporting (Crowe, 2005) used a notional value, based on professional judgement, and applied an estimate of 100 birds for national importance.

Based on I-WeBS data (2011/12 to 2020/21) for the count site covering the northern part of the Proposed Project Site (River Suir Upper), snipe were only recorded once out of nine of the most recent winters of monitoring, and only one bird was recorded. However, for the reasons outlined above, counting from a fixed point, as is typically employed by I-WeBS, will underestimate snipe numbers. Walked surveys, counting flushed birds provides better estimates of numbers utilising a given area. Walkover surveys conducted over winters 2021/22 and 2022/23 covering suitable habitat within the Proposed Project Site generated the following flush counts: 36 birds (18 & 19 December 2021), 28 birds (21 & 22 January 2022), 26 birds (27 & 28 February 2022) and 7 birds (23 & 24 January 2023), with records concentrated along the River Suir and floodplain. Taking into account the species widespread distribution over the winter and noting that there is a high degree of uncertainty regarding the size of the wintering population (Lewis et al. 2019b), the Proposed Project Site is considered to support wintering snipe in numbers of county importance.

Snipe were recorded breeding within the Proposed Project Site and based on breeding behaviour observed (drumming and chipping), it is estimated that there are up to six territories, located in three areas. These breeding sites were associated with very distinct areas holding wetland habitats and the locations where territorial birds were recorded is shown in **Appendix 7G** – see Figure 7G.1, including:

Wetland adjacent to T2, west bank of River Suir supporting:

- 4 territories in 2021, 1-2 territories in 2022

Field of wet grassland between T7 and T5, east of River Suir supporting:

- 2 territories in 2021, 3-4 territories in 2022

Wetland in southeast of 500 m proposed turbine buffer, SE of T10, supporting:

- 1 possible territory in 2022

Taking an Irish breeding population estimate of 4,275 pairs, i.e. 1% threshold of 42 pairs, (NPWS, 2019 & BWI, 2010, applying findings of a review by Lauder & Donaghy, 2008), the Proposed Project Site does not support a nationally important breeding population. There are no county population estimates for breeding snipe; however assuming a relatively even distribution across the country, an appropriate threshold for county importance is taken as 1-2 pairs. The fact that suitable areas of breeding snipe habitat are so distinctly separated from the significantly poorer areas of improved grasslands, highlights that habitat management measures could easily be targeted at these areas to enhance habitat quality for snipe. Several locations in the wider area were also identified as supporting good numbers of wintering and breeding snipe, including the Cabragh pNHA, both the Marshes (south of Thurles) and Tank subsites.

During VP watches 13 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 7 birds and generating 1,142 aggregate flight seconds. A low proportion of the flight time was recorded above 25 m and only 480 aggregate flight seconds were recorded within the CRZ. As detailed in **Appendix 7H**, although snipe were recorded year round a CRM was only run for wintering flight activity, as only 10 seconds was recorded within the CRZ during the breeding season. The CRM for snipe found that predicted collision risk was low, with only 1 collision every 93 years (weighted, 98.0% avoidance). As discussed in **Appendix 7H**, flight activity for this species is largely crepuscular and VP surveys are carried out during daylight hours, and therefore, VP surveys are not always an effective method of estimating snipe flight activity. In addition, being a small, cryptic species flights at distance can easily go undetected. As such, flight time within the 500 m proposed turbine buffer is likely to be underestimated. A correction factor of 25% can be applied to account for nocturnal flight times. However, in this instance applying this factor still generates low outputs, with only 1 collision every 74 years (weighted, 98.0% avoidance).

Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.48 (BTO BirdFacts[9]) to an estimated all-Ireland snipe population of 10,000 birds (based on Crowe, 2005), a notional county/regional population of 380 birds and a local breeding population of 12 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland population (10,000 birds) would require: 51 collisions per year
- County population (380 birds) would require: 2 collisions per year
- Local breeding population (12 birds) would require: 0.06 collisions per year (2 over 35 years)

Due to low annual survivorship, background mortality for snipe is notably high and the generational timeframe is also relatively short with the typical lifespan given as 3 years, with breeding occurring at two years (BTO BirdFacts).

[9] BTO BirdFacts – Snipe: https://www.bto.org/understanding-birds/birdfacts/snipe

In summary the Proposed Project Site is assessed as supporting a wintering (up to 36 birds) and breeding (up to 6 territories) snipe population of county importance. While the CRM suggests low predicted collision risk, there is uncertainty around the use of CRMs for this species and it is also noted that typically, displacement effects are more of concern for this species than collision risk, especially displacement of breeding birds.

7.3.4.14 Species account: Jack snipe

Jack snipe are often recorded in similar habitats to snipe over the winter, although typically occurring at lower densities and are likely to be under recorded. A single jack snipe was flushed from wetland habitat on the west bank of the River Suir during a winter site walkover on 22 January 2022. This species does not breed in Ireland and was downgraded from the amber to green list in the latest BoCCI (2020-2026) assessments (Colhoun & Cummins, 2013 and Gilbert et al., 2021). Given the low level of activity within the Proposed Project Site and favourable conservation status in Ireland, it is considered highly unlikely that the Proposed Project poses any significant population level risks to jack snipe.

In summary, even though jack snipe only occur at low densities and have a favourable conservation status they were not scoped out for further assessment on a precautionary basis, as they are a species which is under recorded and do form part of the regularly occurring assemblage of waterbirds that utilise the area.

7.3.4.15 Species account: Woodcock

Woodcock were not recorded within the Proposed Project Site during dusk surveys undertaken over the breeding season. Despite adequate potential nesting cover identified in the southern woodlands, surveys indicate that the species does not breed in the area. The breeding component of the Irish woodcock population are currently assessed as having an unfavourable (red listed) conservation status, whereas the wintering population is assessed as relatively stable (Gilbert et al., 2021). Small numbers of overwintering woodcock were flushed during winter walkover surveys covering the 500 m proposed turbine buffer. Woodcock are quarry species in Ireland and can be hunted each winter over the open season, November to January inclusive. Therefore, it is considered highly unlikely that the Proposed Project poses any significant population level risks to wintering woodcock utilising the area, although there will be some loss of potential habitat.

7.3.4.16 Species account: Green sandpiper

Green sandpiper do not breed in Ireland, they are mainly passage migrants, with small numbers over wintering. During VP watches one observation of a single green sandpiper was recorded on 28 August 2023 flying for 11 seconds within the 500 m proposed turbine buffer. The low level of flight activity did not warrant a CRM, and it is considered highly unlikely that the Proposed Project poses any significant population level risks to green sandpiper, which have a favourable (green listed) conservation status in Ireland (Gilbert et al., 2021). Therefore based on low observed usage of the Proposed Project Site, green sandpiper was scoped out of further assessment.

7.3.4.17 Species account: Black-headed gull

Black-headed gulls are reported as the most numerous and widespread wintering gull species in Ireland and regularly venture inland from the coast (Lewis et al., 2019b). This species also breeds in Ireland and does establish colonies in wetlands away from the coast (Cummins et al, 2019).

The exact size of the Irish winter population is not accurately reported (Lewis et al., 2019b), although NPWS (2019) provides an estimate for the wintering population of 48,821 birds based on I-WeBS mean peak counts (2011/12 to 2015/16). Based on this estimate, a regularly occurring wintering population of 488 birds would be considered nationally important. I-WeBS data for count sites in Co. Tipperary, including River Suir Upper, Cabragh Wetland and River Suir Middle, is considered unreliable for gulls and on face value suggests there are no locations within 30 km of the Proposed Project Site regularly supporting more than 100 birds. On reviewing the wider I-WeBS data

set, the size of the black-headed gull population likely to be ranging widely across Co. Tipperary over the winter has been estimated at 1,000 to 2,000 birds, and applying a 1% threshold, a regularly occurring wintering population of more than 10-20 birds is taken as being of county importance.

Across three winters of monitoring (2020/21, 2021/22 and 2022/23) black-headed gull were regularly recorded in most months, within or directly around the Proposed Project Site, with peak monthly counts ranging from 2 to 80 birds, and a flock of 200 birds was recorded on one survey day (29 December 2020). Therefore, the wintering population is assessed as being of county importance.

Based on Cummins et al. (2019), the closest black-headed gull colony is within 11 km of the Proposed Project Site, located to the east, near Lisheen Mine and supported 10 or less pairs. One of the largest colonies is located at Lough Derg, which is > 30 km from the Proposed Project Site and over the last monitoring period (2016-2018) supported 400 breeding pairs. Based on NatureScot (2023) the maximum/mean maximum breeding season foraging range for black-headed gull is 18.5 km, so this colony is assessed as being beyond the potential zone of influence. The Irish black-headed gull breeding population is reported as 7,810 pairs and therefore, a site supporting 78 pairs is considered nationally important (Cummins et al., 2019). The only significant breeding numbers in Co. Tipperary are on Lough Derg (400 pairs) and therefore 4 pairs (8 birds) is considered to be of county importance.

Across three breeding seasons of monitoring (2021, 2022 and 2023), black-headed gulls were observed less frequently than over the winter months, and the numbers recorded was also lower, ranging from 1 to 8 birds. The record of 8 birds was only recorded on one date (30 May 2021) and lower counts, 1-4 birds, were more typical. Therefore, based on the small numbers recorded, the population utilising the Proposed Project Site over the breeding season is assessed as locally important, which in combination with the lower frequency of use and the distance from the closest known breeding colony (> 10 km) means that any potential for likely significant effects on breeding birds is considered unlikely.

During VP watches 6 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 2 to 22 birds and generating 2,225 aggregate flight seconds. Approximately half of the flight time was recorded above 25 m and 1,035 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, the CRM for black-headed gull was run allowing for year-round utilisation of the 500 m proposed turbine buffer and found that predicted collision risk was exceptionally low, with only 1 collision every 1,712 years (weighted, 99.2% avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the Proposed Project Site.

In summary, the Proposed Project Site is assessed as being utilised by a wintering black-headed gull population (up to 200 birds) of county importance and smaller numbers (up to 8 birds) over the breeding season assessed as locally important.

7.3.4.18 Species account: Common gull

Over a three year period (October 2020 to September 2023) there were only two common gull observations recorded within or adjacent to the 500 m proposed turbine buffer. These observations were both recorded during VP watches and included two birds flying through the area in December 2021 and a single juvenile (1st calendar year) flying through the area over the summer, in July 2023. These flights amounted to 113 aggregated flight seconds within the 500 m proposed turbine buffer, however only 70 seconds were recorded above 25 m, i.e. within the CRZ. Common gulls were not recorded during wider area surveys and the lack of I-WeBS data for this species from the River Suir Upper and Cabragh Wetlands suggests that the area is not regularly utilised by common gulls. Based on Cummins et al. (2019), the closest breeding common gull colony is a small colony (10 pairs or less) at Lough Derg, more than 30 km away from the Proposed Project Site.

No CRM was run for this species, as only two flights amounting to 70 seconds within the CRZ were recorded. Based on observed usage of the 500 m proposed turbine buffer, collision risk for common gull is assessed as highly unlikely to result in any significant (> 1%) population level effects. In addition low overall usage of the wider area out to 5 km from the Proposed Project Site, means it can be objectively concluded that this area is not important for common gulls and the Proposed Project does not pose any significant population level risks to this species. Therefore, based on low observed usage of the Proposed Project Site common gull was scoped out of further assessment.

7.3.4.19 Species account: Great black-backed gull

Over a three year period (October 2020 to September 2023) there was only one great black-backed gull observation recorded adjacent to the 500 m proposed turbine buffer. This observation was recorded during VP watches and included two birds recorded over 1 km from the 500 m proposed turbine buffer, flying northeast in April 2022 and amounted to 160 aggregated flight seconds at c. 20 m, i.e. out of the CRZ. Great black-backed gull were not recorded during wider area surveys and the lack of I-WeBS data for this species from the River Suir Upper and Cabragh Wetlands suggests the that area is not regularly utilised by great black-backed gull. Based on Cummins et al. (2019), the closest breeding sites are located at the coast or Lough Ree, more than 60 km away from the Proposed Project Site.

No CRM was run for this species, as there were no flights recorded within the CRZ. Based on a lack of observed usage of the 500 m proposed turbine buffer, collision risk for great black-backed gulls is assessed as highly unlikely to result in any significant (> 1%) population level effects. In addition low overall usage of wider area out to 5 km from the Proposed Project Site, means it can be objectively concluded that this area is not important for great black-backed gulls and the Proposed Project does not pose any significant population level risks to this species. Therefore based on low observed usage of the Proposed Project Site great black-backed gull was scoped out of further assessment.

7.3.4.20 Species account: Herring gull

Over a three year period (October 2020 to September 2023) there were only two herring gull observations recorded within or adjacent to the 500 m proposed turbine buffer. These observations were both recorded during VP watches and included one bird flying within the 500 m proposed turbine buffer in April 2021 and was heading south along the River Suir at 20-50 m (Fehily Timoney, 2022). The other observation was another single bird, identified as a juvenile (2nd calendar year) flying just beyond the 500 m proposed turbine buffer, in August 2023 and was recorded for 204 seconds at approximately 60 m. Herring gull were not recorded during wider area surveys and the lack of I-WeBS data for this species from the River Suir Upper and Cabragh Wetlands suggests that the area is not regularly utilised by herring gulls. Based on Cummins et al. (2019), the closest breeding sites are located at the coast, more than 60 km away from the Proposed Project Site.

No CRM was run for this species, as no flights were within the CRZ during the two year study. Based on observed usage of the 500 m proposed turbine buffer, collision risk for herring gull is assessed as highly unlikely to result in any significant (> 1%) population level effects. In addition, low overall usage of the wider area out to 5 km from the Proposed Project Site, means it can be objectively concluded that this area is not important for herring gulls and the Proposed Project does not pose any significant population level risks to this species. Therefore based on low observed usage of the Proposed Project Site herring gull was scoped out of further assessment.

7.3.4.21 Species account: Lesser black-backed gull

Over the last 50 years the number of lesser black-backed gulls overwintering in Ireland has increased significantly (Crème et al., 2014, Ross-Smith et al., 2015, Lewis et al., 2019b). This species also breeds in Ireland and does establish colonies in wetlands away from the coast (Cummins et al. 2019).

The exact size of the Irish winter population is not accurately reported (Lewis et al., 2019b), although NPWS (2019) provides an estimate for the wintering population of 11,842 birds based on I-WeBS mean peak counts (2011/12 to 2015/16). Based on this estimate, a regularly occurring wintering population of 118 birds would be considered nationally important. I-WeBS data for count sites in Co. Tipperary, including River Suir Upper, Cabragh Wetland and River Suir Middle, is considered unreliable for gulls and on face value suggests the area periodically supports up to 200 lesser black-backed gulls. On reviewing the wider I-WeBS data set, the size of the lesser black-backed gull population likely to be ranging widely across Co. Tipperary over the winter has been estimated at 500 birds, and applying a 1% threshold, a regularly occurring wintering population of more than 5 birds is taken as being of county importance.

Across three winters of monitoring (2020/21, 2021/22 and 2022/23) lesser black-backed gulls were regularly recorded in most months, within or directly around the Proposed Project Site, with peak monthly counts during VP watches ranging from 1 to 70 birds, although smaller numbers were typically recorded ranging from 2 to 37 birds. Therefore, the wintering population is assessed as being of county importance.

The Irish lesser black-backed gull breeding population is reported as 7,112 pairs and therefore, a site regularly supporting 71 pairs is considered nationally important (Cummins et al., 2019). There are no significant breeding numbers reported for Co. Tipperary, with the closest site being low densities (10 pairs or less) at Lough Derg, 37 km to the west. The closest large colony is at Lough Ree, 90 km to the north, which has held over > 1000 pairs in recent seasons (Cummins et al., 2019). As this species ranges widely over the breeding season (NatureScot, 2023), an estimate of breeding numbers within approximately 100 km of the Proposed Project Site (*c.* 1,500 pairs) is used to provide a notional value for county/regional importance, which gives a 1% threshold of 15 pairs (30 birds).

Across three breeding seasons of monitoring (2021, 2022 and 2023), lesser blacked gulls were observed less frequently than over the winter months, especially during the 2023 breeding season. Generally the numbers recorded also appeared to be lower, ranging from 1 to 12 birds, with a flock of 70 birds recorded once in August 2022, possibly a post-breeding flock dispersing from a breeding colony. Therefore, based on the small numbers recorded, the population utilising the Proposed Project Site over the breeding season is assessed as locally important.

During VP watches 53 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 70 birds and generating 57,536 aggregate flight seconds. The majority of the flight time was recorded between 25 m and 180 m, with 52,161 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for lesser black-backed gull was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 3.2 years (weighted, 99.5% avoidance), equivalent to 11 collisions over 35 years.

Examination of the temporal distribution of flight time over the two year study found that flight activity was different between the study years, with October 2021 to August 2022 generating significantly higher values when compared with October 2022 to August 2023. Therefore, the model was re-run for the year exhibiting highest levels of flight activity only, which found that predicted collision risk doubles to one collision every 1.5 years (weighted, 99.5% avoidance), equivalent to 22.4 collisions over 35 years.

Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.913 (BTO BirdFacts[10]) to the Irish lesser black-backed gull wintering population of 11,842 birds (Lewis et al. 2019b, NPWS, 2019), breeding population of 14,224 birds (Cummins et al. 2019), an estimated county/regional wintering population of 500 birds (estimated using I-WeBS data) and a local population of 100 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

[10] BTO BirdFacts – Lesser black-backed gull: https://www.bto.org/understanding-birds/birdfacts/lesser-black-backed-gull

- Irish population (11,842/14,224 birds) would require: 10 to 12 collisions per year
- County population (500 birds) would require: 0.4 collisions per year
- Local population (100 birds) would require: 0.1 collisions per year

Taking the highest modelled output for predicted lesser black-backed gull collision risk, 0.64 collisions per annum, any additional mortality due to predicted collision risk would have a less than 1% effect on the Irish breeding population (0.05%, excluding cumulative effects) and the Irish wintering population (0.06%, excluding cumulative effects). Predicted collision risk expresses an effect > 1% above background mortality on the county population and the local population with the potential magnitude of effects estimated at 1.5% and 7.4%, respectively.

In summary, the Proposed Project Site is assessed as being utilised by a wintering lesser black-backed gull population (up to 37 birds) of county importance and smaller numbers (up to 12 birds) over the breeding season assessed as locally important, with usage by a flock of 70 birds recorded in August 2023 (post-breeding). For lesser black-backed gull the worst-case scenario for predicted collision risk, (0.64 collisions/year), indicates that any population level effects would be expressed at the county population and local population level, with the magnitude of effect estimated to low (1.5%) and moderate (7.4%), respectively.

7.3.4.22 Species account: Cormorant

The closest nationally important wetland for cormorant is Lough Derg, which is c. 37 km away. The Lough Derg (Shannon) SPA supports several colonies of breeding cormorant and based on Cummins et al. (2019) held 272 pairs over the last monitoring period (2015-18). The size of the national breeding population is estimated at 4,688 pairs, and therefore 47 pairs would be considered nationally important. Taking the Lough Derg cormorant population as representative of Co. Tipperary, then the 1% threshold for county/regional importance is the regular occurrence of 2-3 pairs (4-6 birds).

According to Lewis et al. (2019b), in Ireland coastal bays support the largest concentrations of wintering cormorant; however the species is also widespread inland, particularly on the larger loughs and parts of the north midlands and west of the country where there are high densities of waterbodies with fish. There are no wetlands identified as regularly supporting nationally important wintering numbers (1% threshold: 110 birds) within 30 km of the Proposed Project Site and again the closest nationally important wetland is Lough Derg, which has supported a peak count of 163 wintering birds (Lewis et al., 2019b). On reviewing I-WeBS data for Co. Tipperary the wintering cormorant population is estimated to be 100-200 birds; therefore, a regularly occurring population of 1-2 birds can be classed as being of county importance.

Most of the observed utilisation of the Proposed Project Site by cormorants, was birds commuting through the area along the River Suir; however small numbers of birds were also recorded loafing and foraging along the river. During VP watches 32 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 3 birds and generating 1,844 aggregate flight seconds. Approximately half the flight time was recorded between 25 m and 180 m, with 989 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for cormorant was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 31 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the Proposed Project Site. Based on an adult survival rate of 0.88 for cormorant (BTO BirdFacts[11]) and taking an estimated Irish breeding population of 4,688 pairs (Cummins et al., 2019) and a wintering population of 10,870 birds (Lewis et al., 2019b), additional annual mortality required to have a 1% population effect would be in the region of 11 to 13 collisions per year.

[11] BTO BirdFacts – Cormorant: https://www.bto.org/understanding-birds/birdfacts/cormorant

In summary, the Proposed Project Site is assessed as being of county importance for small numbers of cormorants (1-3 birds) during the wintering and breeding season, with the River Suir noted as the route taken by commuting birds and also providing a resource for foraging birds. Based on the measured level of predicted collision risk no population level effects are anticipated.

7.3.4.23 Species account: Grey heron

Grey herons are resident in Ireland, with the country hosting an influx of migrants over the winter, and this species is widely distributed, typically occurring in low densities (Lewis et al., 2019). Therefore, only large areas of wetland support nationally important numbers (1% threshold: 25 birds). On reviewing I-WeBS data for Co. Tipperary and allowing for the dispersed distribution of this species, i.e. occurring beyond I-WeBS sites, the wintering grey heron population was estimated to be 50 to 100 birds; therefore, on a precautionary basis a regularly occurring population of 1 bird can be classed as being of county importance.

Surveys in 2020-2021 identified a heronry in the woodland south of the Proposed Project Site [ITM 613090 661048] and approximately 540 m from the closest turbine (Fehily Timoney, 2022 – see Appendix 7I). The heronry was not located in subsequent seasons and was assumed not to have been occupied. Most of the observed utilisation of the Proposed Project Site by grey herons, was birds commuting along the River Suir in the area north of the Rossestown Bridge and birds were also recorded foraging along the river and in adjacent floodplain habitats. The maximum number of birds recorded within the Proposed Project Site was 6 birds, however peak counts of 5-6 birds were only noted occasionally during winter 2020/21 and over the subsequent two survey years, the maximum count was 3 birds, with 1-2 birds most regularly recorded.

During VP watches 51 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 3 birds and generating 2,532 aggregate flight seconds. Approximately half the flight time was recorded between 25 m and 180 m, with 1,306 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for grey heron was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 27 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the Proposed Project Site. Based on an adult survival rate of 0.732 for grey heron (BTO BirdFacts[12]) and taking an acknowledged underestimate of the Irish wintering population of 2,610 birds (Lewis et al., 2019b), additional annual mortality required to have a 1% population effect would have to be higher than 7 collisions per year.

In summary, the Proposed Project Site is assessed as being of county importance for grey herons naturally occurring at low densities (typically 1-3 birds) throughout the year, with the River Suir noted as the route taken by commuting birds and also providing a resource for foraging birds. No population level effects are anticipated, based on the measured level of predicted collision risk.

7.3.4.24 Species account: Little egret

Having only relatively recently colonised Ireland, little egret is not listed as an SCI of any SPAs in spite of its European conservation status as an Annex I species (NPWS, 2013). Since becoming established in Ireland over the late 1990s the little egret population has experienced a notable expansion in range and abundance, with the Irish population estimated at 1,390 birds; and similar to grey heron, this species is now widely distributed across the country, typically occurring in low densities (Lewis et al., 2019b). Therefore, only large areas of wetland support nationally important numbers (1% threshold: 20 birds). On reviewing I-WeBS data for Co. Tipperary and allowing for the dispersed distribution of this species, i.e. occurring beyond I-WeBS sites, the wintering little egret

[12] BTO BirdFacts – Grey heron: https://www.bto.org/understanding-birds/birdfacts/grey-heron

population was estimated to be 50 birds; therefore, on a precautionary basis a regularly occurring population of 1 bird can be classed as being of county importance.

No little egret heronries were identified within or adjacent to the Proposed Project Site. It is possible that the heronry, which has not been active since the 2021 breeding season, also supported little egret, as these two species often nest together; however this was not confirmed. Most of the observed utilisation of the Proposed Project Site by little egrets, was birds commuting along the River Suir in the area north of the Rossestown Bridge and birds were also recorded foraging along the river and in adjacent floodplain habitats. This is remarkably similar with the grey heron activity recorded for the site. The maximum number of little egrets recorded within the Proposed Project Site was 5 birds, however observations of more than 3 birds were only noted occasionally, with 1-2 birds more regularly recorded.

During VP watches 45 flight observations were recorded within the 500 m proposed turbine buffer, with numbers ranging from 1 to 3 birds and generating 2,681 aggregate flight seconds. Only about a quarter of the flight time was recorded between 25 m and 180 m, with 721 aggregate flight seconds recorded within the CRZ. As detailed in **Appendix 7H**, the CRM for little egret was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 36 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the Proposed Project Site. Based on an adult survival rate of 0.712 for little egret (BTO BirdFacts[13]) and taking the estimate of the Irish wintering population as 1,390 birds (Lewis et al., 2019b), additional annual mortality required to have a 1% population effect would have to be higher than 4 collisions per year.

In summary, the Proposed Project Site is assessed as being of county importance for little egret naturally occurring at low densities (typically 1-3 birds) throughout the year, with the River Suir noted as the route taken by commuting birds and also providing a resource for foraging birds. No population level effects are anticipated, based on the measured level of predicted collision risk.

7.3.4.25 Species account: Kingfisher

Kingfisher are listed as an Annex I species on the EU Birds Directive. The desk study determined that the Proposed Project Site is beyond the potential zone of influence of any SPAs where kingfisher are listed as a SCI (NPWS, 2013). The national kingfisher population is estimated at 368 to 1,031 pairs (NPWS,2019) and has an unfavourable (amber list) conservation status (Gilbert et al., 2021). Therefore, a waterbody supporting a minimum of 3-4 pairs would be considered nationally important.

Kingfisher were recorded foraging along the River Suir within the 500 m proposed turbine buffer. No kingfishers were recorded from VP4, located on the Rossestown Bridge and covering part of the River Suir, indicating that there was limited movement up and down the river at this location. Birds were recorded during both winter and breeding season site walkover surveys, with birds detected along the river in the southern extent of the 500 m proposed turbine buffer and also to the north of the buffer.

No breeding sites were identified, and the results of the kingfisher habitat suitability survey found that there was limited nesting bank along the section of the River Suir within the 500 m proposed turbine buffer. The old nesting holes identified by Fehily Timoney (2022) - see **Appendix 7I**, were south of the 500 m proposed turbine buffer. Based on observations of kingfisher during the breeding season, the section of the River Suir occurring within the 500 m proposed turbine buffer is considered to be within the breeding territory of 1 pair nesting somewhere downstream of the Proposed Project Site, with a second territory possibly located upstream.

[13] BTO BirdFacts – Little egret: https://www.bto.org/understanding-birds/birdfacts/little-egret

The low flight trajectory typically employed by this species, as well as the associated flight paths largely following waterbodies, means that the risk of kingfishers colliding with turbines is highly unlikely. Therefore, as is the case for all infrastructural projects potentially affecting watercourses, any activities with the potential for causing a deterioration in water quality leading to a reduction in availability of prey species for kingfishers is the main consideration for mitigation measures aimed at protecting water quality.

In summary, the River Suir within the 500 m proposed turbine buffer is assessed as being of county importance for being within the territories of 1-2 pairs of kingfishers. Potential for likely significant effects relate to prevention of any deterioration in water quality.

7.3.5 Birds of prey - baseline species accounts

For all the surveys conducted covering the Proposed Project Site, the following birds of prey were recorded utilising or flying through the 500 m proposed turbine buffer or in close vicinity:

- Sparrowhawk, hen harrier, buzzard, kestrel, merlin, peregrine, barn owl, long-eared owl and short-eared owl

7.3.5.1 Species account: Sparrowhawk

Sparrowhawks are one of the most common and widespread resident species of raptor occurring in Ireland, and although there appears to have been a medium-term (18 year) decline in abundance, the population is reported as exhibiting relative stability in recent years, with 8,746-14,252 birds estimated for the Republic of Ireland (Lewis et al, 2019a). As such, the conservation status for sparrowhawk has been assessed as favourable (green listed) by Gilbert et al. (2021). Being a dispersed species, sparrowhawk are unlikely to reach densities required for consideration as nationally important (1% threshold: 87-142 birds). As a widespread and regularly occurring resident breeding species of raptor, with consideration given to the species' favourable conservation status, the sparrowhawk population associated with the Proposed Project Site is assessed as important at the local level.

A limited amount of breeding behaviour, such as soaring or actively displaying birds, was observed for sparrowhawks during the baseline surveys for the Proposed Project Site. This did not facilitate the identification of any specific breeding sites beyond the blocks of woodland in the south of the Proposed Project Site, where the presence of birds in suitable habitat over the breeding was indicative of possibly breeding. Potential nesting habitat in tree/scrub cover in the northern part of the Proposed Project Site was more limited, and it is considered that only one possible sparrowhawk breeding site occurs in the southern woodland. There are likely to be several other pairs nesting on the periphery of the Proposed Project Site, which will utilise the area for foraging, and it is judged that the proposal has the potential to have an effect on 2-3 pairs (4-6 birds), which in this assessment is classed as a population of local importance.

As shown by the flight line map in **Appendix 7E** – see Figure 7E.33, during VP watches the majority of sparrowhawk activity was recorded beyond the 500 m proposed turbine buffer and in close proximity to VP1, VP2 and VP3. There were limited observations detected in the northern part of the Proposed Project Site covered by VP4, as well as VP2 and more distantly by VP3. This pattern of usage probably reflects, in part, habitat availability and the more open areas in the north part of the Proposed Project Site would typically be considered less suitable for sparrowhawk. In addition, the inherent difficulty of detecting this species, especially over longer distance and in habitats with a complex structure means that there will generally be a sharp drop off in sparrowhawk detection rates as distance from the VPs increases.

During VP watches there were only 7 flight observations recorded within the 500 m proposed turbine buffer, with all the observations involving single birds and generating 838 aggregate flight seconds. The majority of the flight time was recorded between 25 m and 180 m, with 785 aggregate flight seconds recorded within the CRZ. As

detailed in **Appendix 7H**, the CRM for sparrowhawk was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 81 years (weighted, 98% default avoidance). Notwithstanding the limitations associated with CRMs and sparrowhawk detectability, this level of turbine mediated mortality would be totally imperceptible to background levels.

On balance this species tends to fly relatively low (below rotor swept height), especially when hunting; however, display flights and when commuting over longer distances does result in flight time within the collision risk zone. Running a CRM to account for potential under detection of flight time within the CRZ, requires an over 2 fold increase in the amount of flight time recorded within the CRZ, i.e. 1,800 seconds (785 seconds actually recorded) to result in a predicted collision risk of 1 collision every 35 years. Based on an adult survival rate of 0.69 for sparrowhawk (BTO BirdFacts[14]) and taking a notional population estimate of 350 birds for Co. Tipperary, additional annual mortality required to exert a 1% effect at the county level would have to be at least 1 collision per year. This would require inputting an eighty fold increase in flight time (62,000 seconds). Therefore, it can be objectively concluded that predicted levels of collision, even with adjustments to account for the difficulties associated with sparrowhawk detectability, will almost certainly be negligible in effect.

In summary, woodland habitats within the Proposed Project Site are important for this widespread and commonly occurring species of raptor, and the population recorded is assessed as being of local importance. Restricting the timing for proposed felling operations to periods outside the breeding season, would limit any potential for direct impacts to this species. No population level effects are anticipated, based on the measured and adjusted level of predicted collision risk.

7.3.5.2 Species account: Hen harrier

Hen harriers are an important Annex I species to consider in relation to wind farm developments. The desk study provides a detailed assessment for hen harrier and determined that the Proposed Project Site is beyond the potential zone of influence of any SPAs where hen harrier are listed as an SCI (NPWS, 2013) – see **Appendix 7A** Section 7A.2.2.1. Section 7A.2.2.6.1. The desk study assessed habitat availability within the Proposed Project Site and surrounding hinterland (out to 2 km) as largely unsuitable for breeding hen harrier, an assertion which is supported by the reported breeding range of hen harriers in Ireland (NPWS, 2022, Ruddock et al., 2024). Based on NPWS (2022) there are no known hen harrier roosts within 2 km of the Proposed Project Site.

The baseline surveys undertaken over three years did not record hen harriers breeding or roosting within the 2 km proposed turbine buffer. For all the surveys conducted over the three years hen harriers were only recorded twice, both during VP watches and included the following observations:

- 24-Dec-2020 11:18 Adult male flying S, *c.* 2 km W of buffer 137 sec at 100-200 m
- 28-Aug-2023 12:58 Adult male hunting though the buffer 89 sec at 1-4 m

Based on the low levels of activity recorded no CRM was run for hen harrier and it can be concluded that the 2 km proposed turbine buffer is not heavily utilised by this species and therefore it is highly unlikely that a regularly occupied communal roost exists in the area. Likewise, there are no breeding sites within 2 km of the Proposed Project Site. The Irish hen harrier breeding population is estimated at 106 pairs (Ruddock et al., 2024) and the wintering population is estimated at 311 birds (NPWS, 2019), therefore the 1% threshold of international importance (if associated with an SPA) or national importance is a regularly occurring population of 1 breeding pair (2 birds) and/or 3 wintering birds. Even for a dispersed species like hen harrier, two records over three years

[14] BTO BirdFacts – Sparrowhawk: https://www.bto.org/understanding-birds/birdfacts/sparrowhawk

is representative of exceptionally low levels of activity and does not warrant assessment as a regularly occurring population.

In summary, the baseline study concurs with the findings of the desk study (Appendix 7A), and it can be objectively concluded that the Proposed Project Site and associated wider area (2 km proposed turbine buffer) is not important for breeding or wintering hen harrier populations. Based on exceptionally low recorded usage over a three year period no further assessment for this species is required.

7.3.5.3 Species account: Buzzard

The Irish buzzard population has increased exponentially over the last 25 years (Lusby, 2011, Balmer et al. 2013) and on the basis of an expanding population the species has a favourable (green listed) conservation status (Gilbert et al., 2021). Buzzard is not listed on Annex I of the EU Birds Directive and there are no SPAs where this species is listed as an SCI. The size of the population is unknown, with NPWS (2019) giving a best estimate of 1,938 pairs, which is broadly in line with the figure of 3,500-4,000 birds, as reviewed by Mee (2012). Being a dispersed species, buzzards are unlikely to reach densities required for consideration as nationally important (1% threshold: 20 pairs or 40 birds), unless considered over a wide geographic area. As a widespread and regularly occurring resident breeding species of raptor, with consideration given to the species' favourable conservation status, the buzzard population associated with the Proposed Project Site is assessed as important at the local (higher value) level.

The success of buzzards in Ireland can be attributed to the species having relatively high fecundity for a raptor, capable of regularly fledging broods of up to 4 young (Brown & Amadon, 1986); as well as the ability to exploit numerous food sources, ranging from carrion, worms and larger more mobile prey items like rabbits. Buzzards also employ a variety of foraging techniques (e.g. sitting in tree or active hunting flights), depending on habitat, seasonality and prey types, which has allowed them to expand into a wider range of ecological niches when compared to other raptors occurring in Ireland (Rooney & Montgomery, 2013).

As shown in Appendix 7G – see Figure 7G.4, the Proposed Project Site and surrounding 2 km proposed turbine buffer was found to support up to four breeding territories, with three of these located within the 500 m proposed turbine buffer, including the woodland in the southern part of the buffer and the small T-shaped woodland in the north-east of the buffer. Not all the territories were occupied simultaneously within the same breeding season and young birds just entering the breeding population are often detected prospecting for potential nesting sites. It is considered that the Proposed Project Site and associated 2 km proposed turbine buffer supports three pairs. One of the breeding sites, located within the T-shaped woodland, will be impacted by the proposed infrastructure. However, a single pair of buzzards can have 10 or more alternative nest sites within its breeding season home range, with two to four alternative nests being more typical (Brown & Amadon, 1986). Therefore, as with sparrowhawk, buzzards are considered to be relatively tolerant of felling operations (out of the breeding season) and should readily relocate to an alternative site in the remaining woodland/treelines adjacent to any felled areas.

Buzzards were the most frequently recorded raptor species during VP watches, with 188 flight observations within the 500 m proposed turbine buffer, which generated a total of 47,955 aggregated flight seconds over the two-year study period – see Appendix E: Figure 7E.34, Figure 7E.35, Figure 7E.36 and Figure 7E.37. Numbers ranged from 1 to 4 birds and the majority of flight time was recorded at heights between 25 m to 180 m and a total of 41,192 aggregated flight seconds was recorded within the CRZ.

As detailed in Appendix 7H, the CRM for buzzard was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 1.2 years (weighted, 98% default avoidance). Application of default avoidance (98%) in the CRM may inflate values for predicted collision risk and outputs err on the side of precaution. Adult buzzards are thought to exhibit a higher degree of avoidance, and it is recently fledged young that are considered more susceptible to collision risk.

Nevertheless, the application of default avoidance (98%) in the CRM, while precautionary, acknowledges the susceptibility of buzzards to colliding with turbines and is considered to accurately represent the risk based on recorded flight activity. Predicted collision risk was broadly in line with the results of post-construction collision monitoring studies.

The potential for predicted buzzard collision risk at a rate of 0.86 collisions per annum (applying default 98% avoidance) to have a > 1% population level effect above background mortality is tested by applying an annual survival rate of 0.9 for adult birds and 0.63 for juveniles (BTO BirdFacts[15]) to a local population estimated at 6 adult birds and 6 juveniles (< 3 years old). For the local population the high rate of adult survivorship for buzzard drives a 144% increase in annual mortality, with a lower level of 39% increased mortality generated for juvenile birds. If considering magnitude of effect at a regional level on a population, notionally estimated at > 90 buzzards, then any population level effects diminishes in significance to around 10% additional mortality – see **Appendix 7H:** Table 7H.24.

In summary, the buzzard population associated with the Proposed Project Site is assessed as important at the local level. Woodland habitats, including treelines are important for this species and limiting the timing for proposed felling operations to outside the breeding season, would limit any potential for direct impacts to this species. Predicted collision risk values are highly precautionary and while collisions are anticipated to have likely significant effects on the local breeding population, in the context of an expanding population any additional mortality will have a precautionary moderate effect (c. 10%) on the regional buzzard population, which will recruit into the local area and replace any birds occasionally lost to turbine mediated mortality.

7.3.5.4 Species account: Kestrel

The unfavourable conservation status of the Irish kestrel population was upgraded from amber to red listed by the most recent BoCCI assessment (Colhoun & Cummins, 2013 and Gilbert et al. 2021), due to recent severe declines both in terms of breeding numbers and range (Lewis et al. 2019a). Despite declining numbers, kestrel remains the most widespread raptor in Ireland (Balmer et al., 2013), with a best estimate of 13,500 birds or min-max estimate of 9,918 to 17,393 birds (NPWS, 2019, Lewis et al., 2019a). Being a dispersed species, kestrels are unlikely to reach densities required for consideration as nationally important (1% threshold: 99-173 birds). Given the species unfavourable conservation status, a precautionary approach is applied and the occurrence of one pair is considered to meet the threshold for county importance.

Breeding raptor surveys identified at least two breeding territories within the 2 km proposed turbine buffer, with no nest sites located within the 500 m proposed turbine buffer – see **Appendix 7G**: Figure 7G.4. Based on flight activity recorded during VP watches the Proposed Project Site is within the breeding season home ranges for these two pairs. As shown by kestrel flight line mapping in **Appendix 7E**, flight activity was concentrated in the vicinity of the breeding territories to the north-east and south of the 500 m proposed turbine buffer.

After buzzard, kestrel was the most active raptor species within the Proposed Project Site during VP watches, with 82 flight observations recorded within the 500 m proposed turbine buffer which generated 7,302 aggregate flight seconds. All observations were of single birds and the majority of flight time was recorded at heights between 25 m to 180 m, with a total of 5,225 aggregated flight seconds recorded within the CRZ. As detailed in **Appendix 7H**, the CRM for kestrel was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 4.8 years (weighted, 95% avoidance). The potential magnitude of effect on the local kestrel population due to predicted collision risk was tested on a local population estimate of 6 adult birds and 4 juvenile subadult birds, using the measured rate of 0.21 collisions per annum and applying an annual survival rate of 0.69 to the adult population and 0.32 to the subadult population

[15] BTO BirdFacts – Buzzard: https://www.bto.org/understanding-birds/birdfacts/buzzard

(BTO BirdFacts[16]). This generates a 11% and 8% increase in mortality above background levels, for the adult and subadults components of the population respectively.

In summary, the kestrel population associated with the Proposed Project Site, estimated at 2 pairs, is assessed as important at the county level. Breeding sites were located beyond the 500 m proposed turbine buffer and the predicted collision risk is anticipated to have a moderate (8-11%) effect on the local breeding population.

7.3.5.5 Species account: Merlin

The desk study provides a detailed assessment for merlin and determined that the Proposed Project Site is beyond the potential zone of influence of any SPAs designated for merlin (NPWS, 2013) – see **Appendix 7A**: Section 7A.2.2.6.2. Being a highly secretive species the exact size of the population is unknown, with NPWS (2019) giving a best estimate of 200-400 pairs, and therefore 2-4 pairs would be considered as nationally important. As a rarer breeding raptor species listed on Annex I of the EU Birds Directive, with an unfavourable (amber listed) conservation status in Ireland (Gilbert et al. 2021), any breeding activity beyond an SPA would be assessed as important at the county/regional level. Over the winter merlin populations are more mobile, with numbers inflated by migrants from Iceland and regularly recorded activity over the winter occurring beyond an SPA would be assessed as important at the county/regional level, with national importance assigned should a regularly occupied winter roost be identified.

No merlin breeding activity was recorded within the Proposed Project Site or associated 2 km proposed turbine buffer. The availability of suitable nesting locations supported by suitably open, and prey abundant foraging habitat was assessed as very limited and considered unlikely to support any pairs. Based on a historic record of probable breeding merlin (Bird Atlas 2007-2011), the closest breeding site was found to be associated with the forestry and raised bog approximately 6 km to the northwest, in the vicinity of Lisheen Mine. This distance exceeds the 5 km core foraging range given for breeding merlin in SNH (2016), which is used in assessing potential connectivity with SPAs, as well as the 2 km breeding merlin search area recommended by SNH (2017) for assessing potential impacts of onshore wind farms.

Over three years merlin were recorded on six dates during VP watches, including:

•	11 December 2020	10:55	flying 10 sec at 25-50 m	- in/out of 500 m proposed turbine buffer (VP2)
		Not rec	flying 17 sec at 25-50 m	- out of 500 m proposed turbine buffer (VP2)
		14:00	flying 18 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP3)
		14:09	flying 9 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP3)
•	24 December 2020	09:45 ♂	flying 14 sec at 0-20 m	- in 500 m proposed turbine buffer (VP2)
•	28 December 2020	10:01	flying 15 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP3)
•	16 January 2021	14:54	flying 22 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP3)
•	02 December 2021	13:04 ♀	flying 10 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP3)
		13:11 ♀	flying 10 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP3)
•	11 April 2022	13:20 ♀	flying 20 sec at 0-20 m	- out of 500 m proposed turbine buffer (VP1)

As shown by flight line maps in **Appendix 7E** and **Appendix 7I**, the majority of the merlin observations were recorded out of the 500 m proposed turbine buffer and were also low, below the rotor swept area which is typical flight behaviour for this species. There was only one observation recorded during the breeding season, which was likely to be a bird commuting through the area on passage to breeding grounds. Given the low frequency of

[16] BTO BirdFacts – Kestrel: https://www.bto.org/understanding-birds/birdfacts/kestrel

activity recorded no CRM was run for merlin. Typically, merlin occupy lower ground during the winter months where prey is more abundant, and breed in remoter upland locations or as is the case in Connemara on wooded islands in bogland lough. Whilst the Proposed Project does have some suitable wintering foraging habitat for merlin, it is not considered that merlin are regularly utilising the area beyond sporadic hunting forays into the surrounding area over the winter.

In summary, it can be objectively concluded that the Proposed Project Site and associated wider area are not utilised by merlin during the breeding season, with the low and irregular frequency of utilisation over the winter meaning the area is of limited overall importance to the species. In addition, low flight paths typically employed by this species, especially out of the breeding season, means that collision risk is inherently very low. Therefore, based on low collision risk and low recorded usage over a three year study period, no likely significant effects are anticipated, and merlin are scoped out of any further ornithological impact assessment.

7.3.5.6 Species account: Peregrine

Peregrine is listed on Annex I of the EU Birds Directive, and the closest SPA designated populations to the Proposed Project Site are along the south coast of Waterford and Cork over 60 km away and in the Wicklow Mountains over 90 km away. These SPA populations are assessed as being beyond the potential zone of influence of the Proposed Project Site, based on SNH (2016), which gives the core foraging range for breeding peregrines as 2 km, with a maximum of 18 km and it is noted that depending on local availability of prey, breeding peregrine can travel significant distances from nest sites (Enderson & Craig, 1997). In Ireland peregrine are a widespread resident species, which has achieved a favourable (green listed) conservation status (Gilbert et al., 2021), since the severe population crash over the 1950s, 60s and 70s, induced by the extensive application of organo-chlorine pesticides. Based on NPWS (2019) the conservative estimated population is given as 425 pairs, therefore a regularly occurring population of four pairs is nationally important. Given the peregrines Annex I status, the occurrence of a single pair, which is not associated with an SPA or nationally important population, the pair associated with the Proposed Project Site is classed as being of county importance.

The baseline study confirmed Brittas Castle as a peregrine nest site and the site is located approximately 350 m from the southern borrow pit and within 600 m of the closest turbine, i.e. beyond the 500 m proposed turbine buffer. The core foraging range for breeding peregrines is 2 km, (SNH, 2016) and the Proposed Project Site is likely to form part of the home range for this pair. Availability of nesting locations in this region will be a factor limiting peregrine breeding densities and it is likely that the some of the other castle sites in the area support neighbouring pairs or may be used as alterative nesting/roosting options by the Brittas Castle pair.

Of note, although the nest is in close proximity to the Proposed Project Site, peregrines were only recorded occasionally during most of the surveys, including VP watches, walkovers, wider area breeding raptors and on wider area wintering waterbird surveys. During VP watches a total of 9 peregrine observations were recorded. All the observations were of single birds which generated 1,150 flight seconds within the 500 m proposed turbine buffer, the majority of which were recorded at flight heights within the CRZ, i.e. between 25 and 180 m and amounted to 1,107 seconds. As detailed in **Appendix 7H**, a CRM for peregrine was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 44 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be virtually imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the Proposed Project Site. However, the CRM was run for adult birds and does not take into account the initial flight period for fledgling birds, which are likely to be more susceptible to turbine collision than adult peregrines.

The potential for predicted peregrine collision risk at a rate of 0.021 collision per annum to have a > 1% population level effects above background mortality is tested by applying an annual survival rate of 0.81 for adult birds and

0.6 for juveniles (BTO BirdFacts[17]) to a local population estimated at 2 adult birds and 3 juveniles (< 1 year). At the local population level, relatively low recorded usage of the site predicts that any additional turbine mediated mortality will be 5.5% for adult birds and 1.8% for juveniles above background levels.

In summary, the pair breeding at Brittas Castle are considered of county importance. Predicted collision risk has the potential for a low magnitude of effect (1-5%) on the local breeding population; and in the context of a stable or expanding national peregrine population any additional turbine mediated mortality will have an imperceptible impact (< 1%) on the regional peregrine population, which will recruit into the local area and replace any birds occasionally lost to turbine mediated mortality. Nevertheless, the proximity of the nest to the proposed turbines introduces a level of uncertainty for collision risk to recently fledged birds, especially if dispersal flight behaviour changes from that observed over the baseline. Post-construction monitoring around fledging time is advised to ensure that young peregrines fledge and disperse safely.

7.3.5.7 Species account: Barn owl

The estimated population for barn owl provided in NPWS (2019) is 562 to 702 pairs. As a dispersed breeding species and given the species unfavourable (red listed) conservation status in Ireland (Gilbert et al., 2021), a precautionary approach is applied and the occurrence of one pair is considered to meet the threshold for county importance. It is generally considered that low level flight behaviour of barn owls (typically < 3-4 m) limits collision risk with larger turbines in the UK (and Ireland) where lattice towers are not commonly employed (Barn Owl Trust, 2015). As such, impacts are more likely to be associated with any land use change potentially resulting in loss of breeding territories due to proposed wind farm infrastructure. Collisions associated with traffic, along with secondary poisoning from rodenticide and loss of nest sites are factors affecting barn owl populations in Ireland (Lusby et al., 2021, TII, 2021) and enhancement measures implemented at wind farm sites can have a positive effect, such as erecting nest boxes.

There is a known barn owl breeding site within 1.1 km of the Proposed Project Site, and there is also a breeding site at the Cabragh Wetlands, south of Thurles. The core breeding home range for barn owls in Ireland is reported as 4 to 5 km (9 km max) from the nest (Lusby & Cleary, 2014, TII 2021, Lusby et al. 2021). The Proposed Project provides suitable foraging habitat for barn owls, and it is likely that this species utilises the less agriculturally improved grasslands along the floodplain of the River Suir. The availability of suitable nesting cavities, e.g. hollows in mature trees within the 500 m proposed turbine buffer, was assessed as limited, based on features surveyed for bat roost/nesting owl potential and no evidence of breeding was identified in any of the veteran trees surveyed. Built structures only occur at one location within the 500 m proposed turbine buffer and are associated with a relatively busy farmyard consisting of a series of large, cattle sheds, that although are potentially suitable for barn owl have notably poor connectivity to the wider landscape.

In summary, the Proposed Project Site is likely to be utilised by pairs breeding in the surrounding area, which are assessed as being of county importance. Enhancement measures, through the erection of nest boxes could be employed to improve nesting opportunities for this species.

7.3.5.8 Species account: Long-eared owl

Long-eared owls are a widespread resident in Ireland and are the most commonly occurring species of owl. Over winter numbers can be increased with continental migrants moving into the country to escape periods of cold weather. Long-eared owls are not listed on Annex I of the EU Birds Directive and have a favourable (green listed) conservation status in Ireland (Gilbert et al., 2021). Woodland habitats are important for this species, which nests in dense cover, with woodlands adjacent to open areas providing habitat edge for hunting being optimal (Mikkola, 1983). The Irish population is estimated at 1,484 to 2,703 pairs (NPWS, 2019). Being a dispersed species in Ireland,

[17] BTO BirdFacts – Peregrine: https://www.bto.org/understanding-birds/birdfacts/peregrine

long-eared owls are unlikely to reach densities required for consideration as nationally important (1% threshold: 14-27 pairs), although they can gather at communal roosts over the winter, with numbers of 5 to 30 birds reported.

During dusk surveys long-eared owls were heard calling from the woodland on the southern boundary of the 500 m proposed turbine buffer and were considered likely to be breeding in the vicinity, with the area of woodland in the southern extent of the Proposed Project Site being suitable for this species. As a widespread and regularly occurring resident breeding species, with consideration given to the species' favourable conservation status, the long-eared owl population associated with the Proposed Project Site is assessed as important at the local level. It is also worth noting that this species does not build nests and reuses the old nests of other species like crows, magpies and sparrowhawks (Snow & Perrins, 1998), which means suitably erected nest boxes will also be used.

7.3.5.9 Species account: Short-eared owl

Short-eared owls are classed as a rare and very occasional breeder in Ireland, with a breeding population of 0-5 pairs that breeds sporadically across Ireland selecting upland habitats (Crowe et al., 2021). The breeding population has been assessed as having an unfavourable (amber listed) conservation status (Gilbert et al., 2021) and breeding in Ireland is thought to be limited by low availability of rodent prey, specifically voles. Short-eared owls are listed on Annex I of the EU Birds Directive; however in Ireland, due to the unpredictable and exceptional low breeding densities, there are no SPAs where this species is specifically listed as an SCI. Over the winter there can be an influx of migrants, and small numbers of these winter visitors are typically located where rough grasslands back the coastline (Balmer et al. 2013).

The Proposed Project Site is not considered suitable for breeding short-eared owl. The wet, marshy grasslands along the River Suir do offer some potential foraging habitat for wintering birds, which can be described as nomadic wanderers, moving widely between suitable blocks of habitat in search of prey.

During winter walkover surveys in December 2022, one individual was flushed from rushy habitat within the 500 m proposed turbine buffer, north of Rossestown Bridge and landed in the area again. There were no other observations over the survey period, including three winters (2020/21, 2021/22, 2022/23). Short-eared owls are diurnal, as well as crepuscular, often hunting during the day and if the individual remained in the area for a prolonged period or short-eared owls returned to the area annually, birds would have been recorded more than once. Therefore, based on sporadic occurrence it is assessed that the Proposed Project Site is not important for short-eared owl, which may utilise the area opportunistically along with similar such habitat patches in the wider area. Furthermore, short-eared owls, like hen harriers, hunt at low flight heights over the ground and are therefore considered to be at low risk of collision with turbines. Therefore, based on low observed usage at the Proposed Project Site short-eared owl was scoped out of further assessment.

7.3.6 Red listed other non-passerines

Over the baseline study period, two other non-passerine species with unfavourable (red listed) conservation status in Ireland (Gilbert et al. 2021) were recorded and these species do not fall within the wetland birds or bird of prey categories. This included swift and stock dove. There were no amber listed non-passerine species (non-wetland bird/non-bird of prey) recorded.

7.3.6.1 Species account: Swift

Swifts are a summer visitor to Ireland. The conservation status for swift was upgraded from amber to red listed in the most recently published BoCCI (Gilbert et al., 2021) and as detailed in the desk study swifts are emerging as species susceptible to colliding with turbines (Rydell et al., 2012) – see **Appendix 7A**: Section 7A.2.2.7.1. The

closest reported breeding population to the Proposed Project Site is located in Thurles, approximately 2.5 km to the south and Proposed Project Site is within the breeding season foraging range for swift, which can travel considerable distances from breeding sites to forage at profitable locations, up to 20 km. Lewis et al. (2019a) give a population estimate of 51,728 birds (range: 19,154 to 97,976) for swift, which gives a 1% threshold for nationally importance in the range of 191 to 979 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 500 birds, means a regularly occurring population of 5 birds qualifies for County Importance.

During VP watches flight line data for swifts was not recorded systematically by all surveyors and the data presented is considered to be an underestimate of overall flight time. Swifts were recorded foraging within the 500 m proposed turbine buffer during both breeding seasons 2022 and 2023. Six observations of mostly foraging swifts were recorded during VP watches with flocks ranging in size from 2 to 25 birds generating a total of 325,615 flight seconds, with a limited amount registered within the CRZ (1,575 seconds).

The high amount of flight time was almost entirely generated by two observations of 20 and 25 swifts foraging for up to one hour at a time, which generated 324,000 seconds of flight time. Both observations were recorded in June and during these foraging bouts relatively low flight heights were recorded, with activity concentrated over the River Suir, north of Rossestown Bridge on one occasion and in the north-east of the 500 m proposed turbine buffer on the other – see flight line maps in **Appendix 7E**: Figure 7E.38. For both foraging bouts a flight height range was reported (4-25 m), which put the majority of the flight time below 25 m; however it is likely that birds were also entering the lower limits of the CRZ for a proportion of this time.

To give a purely modelled indication of potential levels of collision risk for swift, CRM outputs can be generated assuming different amounts of flight time within the CRZ, including:

- 1,575 seconds - flight time as reported within the CRZ
- 162,853 seconds - approximately half the overall flight time added into the CRZ
- 325,575 seconds - all the recorded flight time added into the CRZ, excluding time definitely below CRZ

Inputting the default avoidance rate (0.98) and the standard parameters for Turbine Type B (rotational period: 6.85 secs, pitch: 6°), gives following modelled outputs:

- Flight time as reported: 0.081 collision per annum, equivalent to 1 collision every 12 years
- Half the flight time: 8.36 collision per annum, equivalent to 1 collision every 0.12 years
- All the flight time: 16.7 collision per annum, equivalent to 1 collision every 0.06 years

The potential magnitude of effect on the notional regional swift population due to predicted collision risk was tested on a population estimate of 500 birds, using the three outputs for collisions per annum and applying an annual survival rate of 0.808 (BTO BirdFacts[18]). This generated the following indicative results for magnitude of effect:

- For flight time as reported: 0.08% increase in mortality above background levels
- For half the flight time: 8.71% increase in mortality above background levels
- For all the flight time: 17.4% increase in mortality above background levels

For a population of 500 birds the magnitude for population level effects increases above 5%, once additional flight time is added to the model, suggesting that the Proposed Project has the potential to present a moderate effect on the regional swift population.

[18] BTO BirdFacts – Swift: https://www.bto.org/understanding-birds/birdfacts/swift

In summary, the Proposed Project Site is within the breeding season foraging range of swift breeding sites in surrounding towns and villages and periodically supports foraging birds of county importance (> 5 birds). CRMs run on assumed levels of flight time within CRZ indicate that there is potential for moderate (6-20%) population levels effects on the regional swift population.

7.3.6.2 Species account: Stock dove

Stock doves are resident species in Ireland. The conservation status for stock dove was upgraded from amber to red listed in the most recently published BoCCI (Gilbert et al., 2021), having experienced severe declines in abundance and contraction in range, thought to be due to a loss of mixed agricultural production, particular cereal crops, across parts the species' former range (Balmer et al., 2013). Based on Lewis et al. (2019a), the national stock dove population is estimated at 27,486 birds (range: 14,934-43,039 birds). This gives a 1% threshold for national importance in the range of 149 to 430 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 600 birds, means a regularly occurring population of 6 birds (3 pairs) qualifies for County Importance.

Over the study period there was only one record of an individual bird in the southern woodland noted as possibly breeding within the 500 m proposed turbine buffer. Based on a record of one possible breeding pair the Proposed Project Site is assessed as locally important for stock dove. Overall it was noted that arable production was limited in the immediate area, which is likely to limit the occurrence of this species at higher densities.

7.3.7 Red listed passerines

Four species of passerine with unfavourable (red listed) conservation status (Gilbert et al., 2021) were recorded during the baseline study period, including redwing, meadow pipit, grey wagtail and yellowhammer.

7.3.7.1 Species account: Redwing

Redwing are winter visitors to Ireland. The favourable (green listed) conservation status for redwing in Ireland was upgraded to red (Colhoun & Cummins, 2013 and Gilbert et al., 2021), due to recent consideration as a European species of global conservation concern (SPEC 1). There are no population estimates for redwing wintering in Ireland; however they are generally considered a common and widespread winter visitor. Flocks ranging from two to 300 birds were frequently recorded within the 500 m proposed turbine buffer during the non-breeding season. Hedgerows, in particular fruit bearing shrubs provide foraging opportunities over the winter, including hawthorn, elder, rowan and holly. The Proposed Project Site is assessed as supporting a wintering redwing population of local importance.

7.3.7.2 Species account: Meadow pipit

Meadow pipits have an unfavourable (red listed) conservation status in Ireland (Gilbert et al., 2021) due to severe population declines. Declines were thought to be related to harsh winters following the 2009 and 2010 breeding seasons, and despite the crash in numbers, the species has remained relatively common and widespread. Based on Lewis et al. (2019a), the Irish meadow pipit population is estimated at 1,351,995 birds (range: 1,007,407 to 1,726,880 birds) and numbers are reported to have stabilised and may be recovering (Lewis et al., 2020). The 1% threshold for national importance is in the range of 10,000 to 17,000 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 30,000 birds, means a regularly occurring population of 300 birds (150 pairs) qualifies for County Importance.

Meadow pipit were the most abundant and widespread passerine recorded during the breeding season (up to 40 birds), and were also regularly recorded during the winter (up to 45 birds). Meadow pipits are ground nesting, breeding within less intensively managed grassland habitat within the 500 m proposed turbine buffer. Based on

the numbers recorded, the Proposed Project Site is assessed as supporting a breeding and wintering meadow pipit population of local importance.

7.3.7.3 Species account: Grey wagtail

Grey wagtails have an unfavourable (red listed) conservation status in Ireland (Gilbert et al., 2021) due to severe population declines. As for meadow pipit, severe winters during the last Bird Atlas (Balmer et al., 2013) were thought to contribute to the observed population decline in this species, although grey wagtails remained relatively widespread and common on waterways and other waterbodies across Ireland. While noting continued decline Crowe et al. (2014) suggested that this may be stabilising; however based on more recent analysis, Lewis et al. (2020) found that grey wagtail numbers have not recovered and continue to decline. Based on Lewis et al. (2019a), the Irish grey wagtail population is estimated at 50,768 birds (range: 36,949 to 66,035 birds). The 1% threshold for national importance is in the range of 370 to 660 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 1,000 birds, means a regularly occurring population of 10 birds (5 pairs) qualifies for County Importance.

Grey wagtails were observed foraging along the River Suir within the 500 m proposed turbine buffer area and were regularly recorded in small numbers (1 to 4 birds) during breeding and non-breeding seasons. Though no nest sites were identified, a family group of four birds were recorded feeding along the banks of the River Suir during the breeding season (2023), therefore classed as probably breeding within the area. The steep sided, densely vegetated banks of the River Suir within the 500 m proposed turbine buffer, which are without rapids or shingle banks, were assessed as largely unsuitable for this species.

In relation to development projects, grey wagtails regularly utilise holes/crevices in man-made structures as nest sites, including bridges and rock armouring around culverts, but are sensitive to deterioration in water quality. Based on the numbers recorded, the Proposed Project Site is assessed as supporting a breeding and wintering grey wagtail population of local importance.

7.3.7.4 Species account: Yellowhammer

Yellowhammers are a resident species in Ireland and have an unfavourable (red listed) conservation status (Gilbert et al., 2021), due to a server contraction in range and are now largely restricted to areas with tillage. Based on Lewis et al. (2019a), the Irish yellowhammer population is estimated at 217,252 birds (range: 145,092 to 294,597 birds). The 1% threshold for national importance is in the range of 1,450 to 2,945 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 1,000-2,000 birds, means a regularly occurring population of 10-20 birds (5-10 pairs) qualifies for County Importance.

Yellowhammer were not abundant within the 500 m proposed turbine buffer, probably due to the lack of arable crops in the immediate vicinity. Based on breeding season site walkovers there were two territories on the eastern boundary of the 500 m proposed turbine buffer and similarly low numbers were recorded over the winter. Yellowhammers are a species that responded well to habitat enhancement measures, including hedgerow management to improve structure and introduction of some tillage, including leaving winter stubbles and planting plots of wild bird cover. Based on the numbers recorded the Proposed Project Site is assessed as supporting a breeding and wintering yellowhammer population of local importance.

7.3.8 Amber listed passerines

There were 11 amber listed passerines (Gilbert et al., 2021) recorded during survey period and included (* indicates breeding in 500 m proposed turbine buffer) brambling, goldcrest*, house martin, house sparrow, linnet*, sand martin, skylark*, spotted flycatcher*, starling, swallow and willow warbler*.

Most of the breeding species indicated with * nest within scrub and woodland habitats, and therefore are potentially affected by vegetation clearance occurring during the breeding season. Skylarks are the only ground nesting species, nesting in open grassland habitats and like meadow pipits will select the less intensively managed grasslands. Based on the occurrence of the amber listed passerines recorded within the 500 m proposed turbine buffer the Proposed Project Site was assessed as supporting populations of local importance.

7.3.9 Ornithological Value of the Proposed Project Site

The baseline species accounts detail how geographic context for the avi-fauna associated with the Proposed Project was determined, as per the NRA (2009) criteria outlined in Table 7-2. The findings for this part of the assessment are summarised by Table 7-10, which also provides the evaluation of avian sensitivity as per criteria outlined in Table 7-4 (Percival, 2003).

The baseline assessment determined that the Proposed Project Site was not important for several target species that were recorded at low frequencies, and it has been objectively concluded that there is no potential for any likely significant effects, and therefore no further assessment is required for the following species:

- Greylag goose
- Whimbrel
- Dunlin
- Green sandpiper
- Common gull
- Great black-backed gull
- Herring gull
- Hen harrier
- Merlin
- Short-eared owl

The only ornithological feature assessed as nationally important was the breeding lapwing population (up to 6 pairs) attempting to breed within the proposed wind farm site, which based on Percival (2003) is assessed as having high sensitivity. There were no other bird populations which exceeded 1% thresholds for national importance, with most of the other ornithological features identified assessed as having county or local (higher value) importance (NRA, 2009) and medium or low sensitivity (Percival, 2003). The relatively low ranking for the geographic and avian sensitive assessments were due to the lack of any source-pathway-receptor linkage between the Proposed Project Site and SPAs, and therefore although several Annex I species were recorded, as well as wetland birds that are often listed as SCIs, these were not ecologically linked to any designated sites. In addition, populations for two more regularly occurring Annex I species recorded, little egret and peregrine, have a favourable (green listed) conservation status in Ireland (Gilbert et al., 2021).

Table 7-10 Geographic (NRA, 2009) and avian sensitivity (Percival, 2003) evaluation

Feature/species	Conservation status	Annex I	Seasonal occurrence	Typical numbers (maximum count)	Frequency	Ornithological Importance (NRA, 2009)	Conservation Importance/ avian sensitivity (Percival, 2003)
Cabragh Wetlands pNHA	Supports species with unfavourable status		Wintering	Regionally (county) important wetland	Regular	County (regional)	n/a
Lapwing	Unfavourable - red		Breeding & wintering	Up to 6 prs, Win: 10-200 birds (max 500 birds)	Regular	Breeding: Nationally Winter: County	Breeding: High sensitivity Winter: Medium sensitivity
Golden plover	Unfavourable - red	Y	Wintering	Win: 10-200 birds (max 700 birds)	Regular	County (regional)	Medium sensitivity
Snipe	Unfavourable - red		Breeding & wintering	Up to 6 prs, Win: max 36 birds	Regular	County (regional)	Medium sensitivity
Black-headed gull	Unfavourable - amber		All year	Not breeding 2-80 (max 200)	Regular	County (regional)	Medium sensitivity
Lesser black-backed gull	Unfavourable - amber		All year	Not breeding 1-37 birds (max 70 birds)	Regular	County (regional)	Medium sensitivity
Cormorant	Unfavourable - amber		All year	Not breeding 1-2 birds (max 3 birds)	Regular	County (regional)	Medium sensitivity
Whooper swan	Unfavourable - amber	Y	Winter	3-5 birds (max 5 birds)	Infrequent	County (regional)	Medium sensitivity
Shoveler	Unfavourable - red		Winter	max 4 birds	Infrequent	County (regional)	Medium sensitivity
Curlew	Unfavourable - red		Winter	(1-30 birds I-WeBS) (current max 1 birds)	Infrequent	County (regional)	Medium sensitivity
Kingfisher	Unfavourable - amber	Y	All year	Not breeding - territory of 1-2 pairs	Infrequent	County (regional)	Medium sensitivity
Little egret	Favourable - green	Y	All year	Not breeding 1-2 birds (max 5 birds)	Regular	County (regional)	Medium/Low sensitivity
Grey heron	Favourable - green		All year	Not breeding 1-2 birds (max 6 birds)	Regular	County (regional)	Low sensitivity (not assessed)
Mute swan	Unfavourable - amber		Breeding & wintering	1 pr, Win: 2-6 birds (max 6 birds)	Regular	Local (higher value)	Low sensitivity
Wigeon	Unfavourable - amber		Wintering	< 20 birds (max 80 birds)	Regular	Local (higher value)	Low sensitivity
Mallard	Unfavourable - amber		Breeding & wintering	poss. breeding, Win: 1-7 birds (max 60 birds)	Regular	Local (higher value)	Low sensitivity
Teal	Unfavourable - amber		Wintering	1-4 birds (max 120 birds)	Regular	Local (higher value)	Low sensitivity
Jack snipe	Favourable - green		Wintering	max 1 birds	Regular	Local (higher value)	Low sensitivity (not assessed)
Woodcock	Favourable – green (winter)		Wintering	Not breeding, Win: 3 birds	Regular	Local (higher value)	Low sensitivity (not assessed)
Greylag goose	Unfavourable - amber (poss. feral)		Winter	1-2 birds (max 2 birds)	Very infrequent	Site not important	exclude from further assessment
Whimbrel	Favourable - green		Winter	max 3 birds	Very infrequent	Site not important	exclude from further assessment
Dunlin	Unfavourable - red	Y	Winter	max 16 birds	Very infrequent	Site not important	exclude from further assessment
Green sandpiper	Favourable - green		Winter	max 1 bird	Very infrequent	Site not important	exclude from further assessment
Common gull	Unfavourable - amber		Winter	max 2 birds	Very infrequent	Site not important	exclude from further assessment
Great black-backed gull	Favourable - green		Winter	max 1 bird	Very infrequent	Site not important	exclude from further assessment

Feature/species	Conservation status	Annex I	Seasonal occurrence	Typical numbers (maximum count)	Frequency	Ornithological Importance (NRA, 2009)	Conservation Importance/ avian sensitivity (Percival, 2003)
Herring gull	Unfavourable - amber		Winter	max 1 bird	Very infrequent	Site not important	exclude from further assessment
Kestrel	Unfavourable - red		All year	Est. 2 prs, 4-6 birds	Regular	County (regional)	Medium sensitivity
Barn owl	Unfavourable - red		All year	1 pr in wider area	Infrequent	County (regional)	Medium sensitivity
Peregrine	Favourable - green	Y	All year	1 pr, 2 adult birds plus up to 4 juv.	Regular	County (regional)	Medium/Low sensitivity
Sparrowhawk	Favourable - green		All year	Est. 2-3 prs, 4-6 birds	Regular	Local (higher value)	Low sensitivity (not assessed)
Buzzard	Favourable - green		All year	Est. 3 prs, 6 adult birds plus 4-6 juv.	Regular	Local (higher value)	Low sensitivity (not assessed)
Long-eared owl	Favourable - green		All year	1 pr	Regular	Local (higher value)	Low sensitivity (not assessed)
Hen harrier	Unfavourable - amber	Y	n/a	Only 2 observations over 3 years	Very infrequent	Site not important	exclude from further assessment
Merlin	Unfavourable - amber		Winter	Only observed on 6 dates over 3 years	Very infrequent	Site not important	exclude from further assessment
Short-eared owl	Unfavourable - amber	Y	Winter	max 1 bird	Very infrequent	Site not important	exclude from further assessment
Swift	Unfavourable - red		Summer foraging	2-25 birds	Regular	County (regional)	Medium sensitivity
Stock dove	Unfavourable - red		Breeding	1 pr	Infrequent	Local (higher value)	Medium sensitivity
Redwing	Unfavourable - red		Wintering	2-300 birds	Regular	Local (higher value)	Medium sensitivity
Meadow pipit	Unfavourable - red		Breeding & wintering	Est. 20-30 prs, Win: up to 45 birds	Regular	Local (higher value)	Medium sensitivity
Grey wagtail	Unfavourable - red		Breeding & wintering	1 pr, 1-4 birds	Regular	Local (higher value)	Medium sensitivity
Yellowhammer	Unfavourable - red		Breeding & wintering	2 prs, small numbers wintering	Regular	Local (higher value)	Medium sensitivity
Amber listed passerines – brambling†, goldcrest*, house martin•, house sparrow•, linnet*, sand martin•, skylark*, spotted flycatcher*, starling•, swallow•·& willow warbler*	Unfavourable - amber		Breeding*, wintering†, present•	n/a	n/a	Local (higher value)	Low sensitivity

*= breeding behaviour recorded, ● = species present (no breeding behaviour recorded, but likely to breeding in wider area), † = recorded over the winter/on passage

7.4 Assessment of potential significant effects

This section assesses the potential significant effects of the Proposed Project on the important ecological features, as outlined in Table 7-10. Direct and secondary (indirect) effects are considered in turn under the following heading:

- 'Do Nothing' Scenario
- Construction Phase
- Operational Phase
- Decommissioning Phase
- Cumulative Effects

The potential for cumulative effects during the construction and operatorial phases of the proposal are assessed at the end of each relevant section. No potential for transboundary effects were identified.

7.4.1 Do-Nothing

The Proposed Project Site encompasses agricultural land and commercial forestry plantation that are currently managed through a combination of intensively managed pasture and agroforestry practices. If the Proposed Project does not proceed, the area is considered likely to remain in use for agriculture and forestry purposes. The ecological value of the Proposed Project Site for birds would be expected to remain comparable with current conditions. The Thurles and Environs Local Area Plan 2024-2030 (Policy 6.6, Objective 6A) indicates that the southern part of the Proposed Project Site may be encompassed by the lands required to construct the Thurles-by-pass in the future, if funding can be secured.

7.4.2 Construction Phase

The construction phase will result in a certain amount of inevitable impact, largely in the form of habitat loss/alteration and disturbance to facilitate construction of site access tracks, turbine bases, hardstand areas, substation and excavation for the cabling trenches to facilitate grid connection, which is underground. During the construction phase tree felling operations will be undertaken to implement mitigation for bats by maintaining 50 m standoffs between rotor swept areas and features utilised by bats (50 m bat feature buffer). Some habitat loss incurred during construction will have short-term effects (EPA 2022) and areas will be restored to previous condition or ecologically enhanced. This includes any areas adjacent to the infrastructural footprint affected by construction works, temporary storage areas for spoil, temporary works compounds and the area of the borrow pit. Any long-term effects (EPA, 2022) of habitat loss on ornithological receptors due to the final infrastructural footprint of the Proposed Project are assessed as part of the operational phase of the proposed project – see Section 7.4.4.

Timing of the construction works will have an effect on the level and type of impact, since a number of species are known to be seasonally sensitive or seasonally located within and adjacent to the proposed construction corridor, such as the wintering waterbird assemblage and breeding lapwing and snipe. In terms of the zone of influence for construction works, potential for direct effects to occur were assessed within 20 m of the proposed site infrastructure, including temporary features (site compound, deposition areas) and for the grid connection route this was reduced to 5 m. This assessment area is referred to as the works/construction corridor or proposed construction footprint. Indirect (secondary) effects on ornithological receptors to works occurring within the construction corridor are assessed with regard to types of works proposed and the sensitives of the receptor, as published/reviewed in Goodship & Furness (2022), Goodship & Furness (2019), Tosh et al. (2014), Cutts et al. (2013), Pearce-Higgins (2012 & 2009).

In the absence of mitigation measures, construction works have the potential to impact on water quality, through sedimentation and pollution of local watercourses, which can impact on food resources and habitats supporting waterbird populations and in this instance riverine species, such as cormorant, grey heron, kingfisher and grey wagtail, that utilise the River Suir. Given the scale and type of construction works proposed, as well as the location of construction footprint, it is not anticipated that the Proposed Project will influence water levels in the River Suir or have any effect on flooding along this stretch of the river.

Typically, the construction phase for wind farm development is less than two years, and this in instance the proposed programme of works is 18-months, therefore for ornithological receptors temporal magnitude of disturbance effects emanating from the construction phase of the project will be short-term effects – effects lasting one to seven years (EPA, 2022).

Likely significant effects during the construction phase encompass both direct and indirect (secondary) effects, which are summarised as follows:

Likely Sources of direct effects during the construction phase include:

- Clearance of vegetation, transporting soil and rock for constructing internal site access roads, hardstands and turbine bases, as well as small areas of vegetation removal to facilitate turbine delivery to site;
- Clearance of woodland/scrub/treelines/hedgerows around turbines to implement bat feature buffers;
- Creation of temporary infrastructure such as site compound, blade set-down areas and crane pads;
- Excavation trenches for cable ducting; and
- Placement of material arising from infrastructure works.

Likely sources of secondary effects during the construction phase include:

- Stockpiling of materials on-site (run-off, erosion etc.);
- Collection/drainage of surface water runoff; and
- Construction activity/noise resulting in avoidance by birds due to disturbance.

The likelihood of significant effects upon ornithological features along the turbine delivery route (TDR) where modifications to areas are required to facilitate the passage of large vehicles and components, was assessed. There is no potential for significant effects, which will be avoided by utilising the existing road network for the transportation of turbines to the site. Any works along the TDR associated with vegetation removal occur directly adjacent to or within the Proposed Project area and are assessed within the following sections.

7.4.2.1 Designated sites - Likely Construction Phase Effects

As detailed in Appendix 7A: Section 7A.2.2.1 and Section 7A.2.2.2, the Proposed Project is not located within or directly adjacent to any Natura 2000 site (SAC/SPA), nationally designated site (NHA) or proposed conservation site (pNHA). Therefore, construction works will not directly impact on any sites designated for nature conservation.

As fully detailed in the in the desk study presented in Appendix 7A, the only designated site where potential ornithological source-pathway-receptor linkage were identified between the Proposed Project Site and avian features of interest was for the southern part of the Cabragh Wetlands pNHA. The Proposed Project Site and the Cabragh Wetlands are considered likely to contribute, along with other locations, to supporting a relatively mobile wintering waterbird population of county (regional) importance. Construction works have the potential to displace wintering waterbirds from the Proposed Project Site. The Cabragh Wetlands, which is a site managed for wintering waterbirds could act as a sink for any birds that may be displaced as result of construction activities. The proposed programme of works construction will last 18 months, which is classified as a short-term effect – effect lasting one to seven years (EPA, 2022).

The baseline accounts for wintering waterbirds potentially utilising both the Cabragh Wetlands and the Proposed Project Site, in particular flocks of lapwing and golden plover, show that usage of the both areas is periodic and

there are several alternative locations also supporting these mobile flocks. This pattern in distribution is probably opportunistic, linked to on-site conditions such as flooding, land-use and disturbance. Given the variation in counts between winter seasons, as well as between monthly counts; periodic usage of different locations indicates that neither the Proposed Project Site or the Cabragh Wetlands are critical for supporting the regional wintering waterbird population. Therefore, it is anticipated that any short-term disturbance and/or displacement effects on wintering waterbirds during construction will be imperceptible and not significant (EPA, 2022).

7.4.2.2 Lapwing - Likely significant Construction Phase Effects

There is potential for inappropriately monitored/phased construction works occurring during the breeding season to result in direct disturbance to nesting lapwing and precocious young. Mitigation by design has ensured core lapwing breeding areas are largely avoided which will minimise direct effects, however construction activities in close proximity to nesting birds also have the potential to result in disturbance factors leading to displacement and contributing to nest failure.

While it is acknowledged that on-site habitat conditions during the baseline study were sub-optimal for breeding lapwing, in the absence of mitigation, construction activities have the potential to cause the short-term loss of 6 pairs of lapwings, which are assessed as nationally important (NRA, 2009). The magnitude of population level effect, caused by displacement of 6 pairs, would be low: 1-5% (Percival, 2003) given a national breeding population of 476 to 620 pairs (NPWS, 2019). Therefore, based on Percival (2003) taking a high sensitivity for breeding lapwing and a low magnitude effect results in an adverse effect of low significance on a nationally important population (NRA, 2009), over the short-term (EPA, 2022).

Disturbance effects caused by construction activities have the potential to displace wintering lapwing which utilise the Proposed Project Site periodically in numbers of county importance (NRA, 2009). The magnitude of population level effect caused by displacement of 200-500 birds would be moderate: 6-20% (Percival, 2003), given a regional wintering population estimated at 2,000-3,000 birds. Therefore, based on Percival (2003) taking a medium sensitivity for wintering lapwing and a moderate magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022). This assessment is highly precautionary, as the wintering lapwing population is not wholly reliant on the Proposed Project Site and in the context of the wide availability of alternative sites in the wider area, such as Cabragh Wetlands, as well as favoured areas northwest of the Proposed Project Site including Clonamuckoge Beg/Kilkillahara.

In the absence of quantitative studies for both coastal and terrestrial habitats, Cutts et al. (2013) apply a precautionary approach recommending minimum distances for the application of mitigation measures to limit sensitivity to visual disturbance at 300 m and noise disturbance at 200 m within estuarine habitats used by wintering lapwing. These are lower than maximum flight initiation distance (FID) given in Goodship & Furness (2019) which is 450 m in response to pedestrian disturbance (as a proxy for potential sensitivity to seaweed harvesting). Regular shooting of wildfowl along the banks of the River Suir within the 500 m proposed turbine buffer during the open season (September to January inclusive) means lapwing, although not a quarry species, are likely to be vigilant of human activity. Therefore, it is anticipated that initially wintering lapwing will be displaced to alternative areas by construction works occurring during the non-breeding season (e.g. moving away to Clonamuckoge Beg/Kilkillahara).

7.4.2.3 Golden plover - Likely significant Construction Phase Effects

Disturbance effects caused by construction activities have the potential to displace wintering golden plover which utilise the Proposed Project Site periodically in numbers of county importance (NRA, 2009). The magnitude of population level effect, caused by displacement of 200-700 birds, would be moderate: 6-20% (Percival, 2003) given a regional wintering population estimated at 3,000-5,000 birds. Therefore, based on Percival (2003) taking a medium sensitivity for wintering golden plover and a moderate magnitude effect results in an adverse effect of

low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022). This assessment is highly precautionary, as the wintering golden plover population is not wholly reliant on the Proposed Project Site and also in the context of the high availability of alternative sites in the wider area, such as Cabragh Wetlands, as well as favoured areas northwest of the Proposed Project Site including Clonamuckoge Beg/Kilkillahara.

Due to hunting of wildfowl within the Proposed Project Site over the open season (September to January, inclusive) golden plover are likely to be vigilant of human activity at this location. Although listed as quarry species not many hunters take golden plover, and it is thought that the main focus of shooting activities are ducks and possibly some rough shooting of snipe and woodcock. Goodship & Furness (2022) suggest a buffer of 200-500 m for golden plover during the non-breeding season but note a lack of scientific studies to support this buffer. Likewise, in the absence of quantitative studies for both coastal and terrestrial habitats, Cutts et al. (2013) apply a precautionary approach recommending minimum distances for the application of mitigation measures to limit sensitivity to visual disturbance at 200 m and noise disturbance at 300 m within estuarine habitats. These are lower than maximum flight initiation distance (FID) of 450 m for non-breeding golden plover given in Goodship & Furness (2019) in response to pedestrian disturbance (as a proxy for potential sensitivity to seaweed harvesting). Given the existing sensitivity of wintering golden plover in this area to disturbance from hunting, it is anticipated that initially golden plover will be displaced to alternative areas by construction works occurring during the non-breeding season (e.g. moving away to Clonamuckoge Beg/Kilkillahara).

7.4.2.4 Snipe - Likely significant Construction Phase Effects

There is potential for inappropriately monitored/phased construction works occurring during the breeding season to result in direct disturbance to nesting snipe and precocious young. Mitigation by design has ensured core snipe breeding areas are largely avoided which will minimise direct effects, however construction activities in close proximity to nesting birds also have the potential to result in displacement and contribute to nest failure. Pearce-Higgins et al. (2012) found snipe densities declined by 53% on wind farm sites during construction.

Therefore, in the absence of mitigation, proposed construction activities have the potential to cause the short-term displacement of 3 pairs of snipe, (i.e. 50% of the six territories identified), which are assessed as having county importance (NRA, 2009). Assuming the effect is reversable, and pairs return post-construction, the magnitude of population level effect, caused by displacement of 3 pairs, would be low: 1-5% (Percival, 2003) given an estimated county breeding population of 100 to 200 pairs. Therefore, based on Percival (2003) taking a medium sensitivity for breeding snipe and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022). Potential for longer term displacement effects are assessed under operational effects.

Disturbance effects caused by construction activities have the potential to displace wintering snipe which utilise the Proposed Project Site in numbers of county importance (NRA, 2009). The magnitude of population level effect, caused by displacement of 36 birds, would be moderate: 6-20% (Percival, 2003) given a regional wintering population estimated at 300-400 birds. Therefore, based on Percival (2003) taking a medium sensitivity for wintering snipe and a moderate magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022). This assessment is highly precautionary, as the wintering snipe population is not wholly reliant on the Proposed Project Site and in the context of the availability of alternative sites in the wider area, such as the Tank wetlands and the Cabragh Wetlands.

7.4.2.5 Black-headed gull - Likely significant Construction Phase Effects

Black-headed gulls are considered unlikely to be adversely affected by construction activities within an agricultural landscape, as they often forage in disturbed ground and are relatively tolerant of disturbance. In addition, the

birds utilising the area are not wholly reliant on the Proposed Project Site and there are alternative sites available in the wider area.

7.4.2.6 Lesser black-backed gull - Likely significant Construction Phase Effects

Lesser black-backed gulls are considered unlikely to be adversely affected by construction activities within an agricultural landscape, as they often forage in disturbed ground and are relatively tolerant of disturbance. In addition, the birds utilising the area are not wholly reliant on the Proposed Project Site and there are alternative sites available in the wider area.

7.4.2.7 Cormorant - Likely significant Construction Phase Effects

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during construction could result in a significant detrimental change in water quality in the River Suir located adjacent to the construction footprint; and could result in indirect pollution mediated effects on cormorant, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 100-200 birds. Therefore, based on Percival (2003) taking a medium sensitivity for cormorant and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022).

Cormorants are considered unlikely to be adversely affected by construction activities; as commuting flights, foraging and loafing are associated with the River Suir, which is largely avoided by the footprint of the Proposed Project.

7.4.2.8 Whooper swan - Likely significant Construction Phase Effects

Whooper swans have not been recorded regularly utilising the Proposed Project Site since winter 2016/17. Over the 3-year baseline study, a small flock (3- 5 birds) regularly utilised the area north of the 500 m proposed turbine buffer (Clonamuckoge Beg/Killkillahara) during winter 2020/21; however in subsequent study years only two birds were recorded once foraging within the Proposed Project Site in winter 2021/22. Given the low levels of usage it is considered unlikely that whooper swans will be adversely affected by construction activities and no likely significant effects are anticipated.

7.4.2.9 Shoveler - Likely significant Construction Phase Effects

It is considered unlikely that shoveler will be adversely affected by construction activities, due to low usage of the Proposed Project Site and when recorded birds were utilising flooded fields removed from the proposed infrastructure. Goodship & Furness (2022) suggest a non-breeding season buffer zone of 100-200 m from shoveler.

7.4.2.10 Curlew - Likely significant Construction Phase Effects

It is considered unlikely that curlew will be adversely affected by construction activities, due to low usage of the Proposed Project Site. There are no contemporary breeding records for this species and usage of the Proposed Project Site is only recorded very occasionally by small numbers of birds.

7.4.2.11 Kingfisher - Likely significant Construction Phase Effects

The baseline study found that the Proposed Project Site does not support any breeding sites, however this stretch of the River Suir forms part of the territory of 1-2 pairs of kingfisher, which is assessed as being of county importance.

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during construction could result in a significant detrimental change in water quality in the River Suir located adjacent to the footprint of construction works; and could result in indirect pollution mediated effects on kingfisher, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 pairs, would be high: 20-80% (Percival, 2003) given an estimated loss in home range of up to 80%. Therefore, based on Percival (2003) taking a medium sensitivity for kingfisher and a high magnitude effect results in an adverse effect of medium significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022).

Kingfisher are considered unlikely to be adversely affected by disturbance arising from construction activities; as commuting flights, foraging and loafing are associated with the River Suir, which is largely avoided by the footprint of the Proposed Project. The area where the works will come closest to the river around Rossestown Bridge did not generate any kingfisher records and the stretch of the river was particularly well covered from VP4, indicating that the area is not heavily utilised by kingfisher.

Goodship & Furness (2022) suggest a breeding and non-breeding season buffer zone of 50-100 m, depending on habituation levels, to protect kingfisher from pedestrian disturbance, especially to protect any nest or roost sites identified.

7.4.2.12 Little egret - Likely significant Construction Phase Effects

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during construction could result in a significant detrimental change in water quality in the River Suir located adjacent to the footprint of construction works; and could result in indirect pollution mediated effects on little egret, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 50 birds. Therefore, based on Percival (2003) taking a medium sensitivity for little egret and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022).

Little egrets are considered unlikely to be adversely affected by disturbance arising from construction activities; as commuting flights, foraging and loafing are associated with the River Suir, which is largely avoided by the footprint of the Proposed Project.

7.4.2.13 Grey heron - Likely significant Construction Phase Effects

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during construction could result in a significant detrimental change in water quality in the River Suir located adjacent to the footprint of construction works; and could result in indirect pollution mediated effects on grey heron, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 50-100 birds. Therefore, based on Percival (2003) taking a precautionary low sensitivity[19] for grey heron and a low magnitude effect results in an adverse effect of very low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022).

[19] Note: Technically, based on Percival (2003), grey heron, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as a wintering waterbird occurring at low densities that may be susceptible to disturbance at the local population level.

Grey herons are considered unlikely to be adversely affected by disturbance arising from construction activities; as commuting flights, foraging and loafing are associated with the River Suir, which is largely avoided by the footprint of the Proposed Project.

7.4.2.14 Mute swan - Likely significant Construction Phase Effects

Mute swans breeding or wintering are considered unlikely to be adversely affected by disturbance arising from construction activities; as commuting flights, foraging and loafing are associated with the River Suir, which is largely avoided by the footprint of the Proposed Project. In addition, mute swan is a species notably tolerant of human activities (e.g. Tuite et al., 1984).

7.4.2.15 Wigeon - Likely significant Construction Phase Effects

It is considered unlikely that wigeon will be adversely affected by construction activities, due to low usage of the Proposed Project Site and when recorded, birds were typically utilising flooded fields removed from the proposed infrastructure.

7.4.2.16 Mallard - Likely significant Construction Phase Effects

Cutts et al. (2013) note that sensitivity to disturbance is likely to vary between mallard populations and will be less where birds are habituated to human activity, e.g. in urban areas (flushing range: 25-300 m), compared to those in the wider countryside, where birds are less exposed to human activity (flushing range: up to 500 m). In addition, hunting of wildfowl within the Proposed Project Site means wintering duck populations will be hypervigilant. Therefore, birds are likely to perceive people walking as a threat, including construction workers, and respond accordingly by flushing and probably leaving the area. Cutts et al. (2013) note higher levels of tolerance to machinery and mallard have been recorded foraging within 50 m of plant. A review by Goodship & Furness (2022) suggest a breeding season buffer zone of 50-100 m and non-breeding season buffer zone ≥ 100 m.

Mallards were found to be a regularly occurring wetland bird species within the Proposed Project Site during both the winter and breeding seasons, with relatively small numbers typically recorded (1-6 birds) and it was possible that nesting females were utilising areas of dense cover. It is considered unlikely that mallard will be adversely affected by construction activities, as foraging and nesting habitat is associated with the River Suir, which is largely avoided by the footprint of the Proposed Project. Given the low numbers of mallard recorded and avoidance of favoured habitats during construction, combined with the short duration of works, no significant (>1%) population level effects are anticipated for mallard. Based on Percival (2003), taking a medium sensitivity for mallard and a negligible: < 1% magnitude effect results in an assessment of not significant.

7.4.2.17 Teal - Likely significant Construction Phase Effects

Typically, small numbers (1-4 birds) were recorded along the River Suir over the winter, with the higher numbers (26 birds) recorded in the small pond in the southern woodland. It is considered unlikely that teal will be adversely affected by construction activities, as areas utilised by teal including the River Suir, will be largely avoided by the footprint of the Proposed Project. Given the low numbers of teal recorded and avoidance of favoured habitats during construction, combined with the short duration of works, no significant (>1%) population level effects are anticipated for teal. Based on Percival (2003), taking a medium sensitivity for teal and a negligible: < 1% magnitude effect results in an assessment of not significant.

7.4.2.18 Grey heron - Likely significant Construction Phase Effects

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during construction could result in a significant detrimental change in water quality in the River Suir

located adjacent to the footprint of construction works; and could result in indirect pollution mediated effects on grey heron, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 50-100 birds. Therefore, based on Percival (2003) taking a precautionary low sensitivity[20] for grey heron and a low magnitude effect results in an adverse effect of very low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022).

Grey herons are considered unlikely to be adversely affected by disturbance arising from construction activities; as commuting flights, foraging and loafing are associated with the River Suir, which is largely avoided by the footprint of the Proposed Project.

7.4.2.19 Jack snipe - Likely significant Construction Phase Effects

Small numbers of jack snipe were recorded during winter surveys. Disturbance effects caused by construction activities have the potential to displace wintering jack snipe which utilise the Proposed Project Site in small numbers and are assessed as being of local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by displacement of 1-2 birds, would be low: 1-5% (Percival, 2003) given that this species naturally occurs in low densities. Therefore, based on Percival (2003), taking a precautionary low sensitivity[21] for wintering jack snipe and a low magnitude effect results in an adverse effect of very low significance on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022).

7.4.2.20 Woodcock - Likely significant Construction Phase Effects

Wintering woodcock utilise the woodland and scrub habitats within the Proposed Project Site for day roosting and will forage in adjacent grassland habitat at night. No breeding territories were identified. Areas of woodland and scrub potentially utilised by wintering woodcock will be cleared to facilitate construction of the proposed wind farm and associated infrastructure. The overall extent of the woodland that will be removed has been kept to a minimum and only relatively small areas will be subject to clearance. Therefore, it is considered that there are ample opportunities for woodcock to re-locate and utilise alternative areas of roosting habitats in the vicinity.

Disturbance effects caused by construction activities, including removal of woodland, have the potential to displace wintering woodcock, which utilise the Proposed Project Site in small numbers and are assessed as being of local (higher value) importance (NRA, 2009). While the breeding woodcock population has been assessed as having an unfavourable (red listed) conservation status the wintering population is not listed as being of conservation concern (Gilbert et al., 2021). The magnitude of population level effect, caused by slight displacement effects on wintering birds, would be negligible: < 1% (Percival, 2003). Therefore, based on Percival (2003), taking a precautionary low sensitivity[22] for wintering woodcock and a negligible magnitude effect results in an adverse effect of very low significance on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022).

7.4.2.21 Kestrel - Likely significant Construction Phase Effects

Nesting locations utilised during the 2021, 2022 and 2023 breeding seasons were beyond the 500 m proposed turbine buffer. There is potential nesting habitat within the proposed footprint for construction works, specifically

[20] Note: Technically, based on Percival (2003), grey heron, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as a wintering waterbird occurring at low densities that may be susceptible to disturbance at the local population level.
[21] Note: Technically, based on Percival (2003), jack snipe, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as a wintering waterbird occurring at low densities that may be susceptible to disturbance at the local population level.
[22] Note: Technically, based on Percival (2003), wintering woodcock would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as the breeding population has an unfavourable conservation status (Gilbert et al., 2021), although wintering population is not listed as being of conservation concern.

the area of woodland that will be cleared to facilitate construction of the Proposed Project. Kestrel often use different nest sites between years and if either of the resident pairs shifted nest site during the build, inappropriately monitored/phased construction works could result in direct or indirect disturbance of breeding kestrel. Therefore, in the absence of mitigation, construction activities have the potential to have displacement effects on 1 pair of kestrel, which are assessed as having county importance (NRA, 2009). The magnitude of population level effect, caused by direct effects on 1 pair, would be low: 1-5% (Percival, 2003) given an estimated county breeding population of 100 to 200 pairs. Based on Percival (2003), taking a medium sensitivity for breeding kestrel and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term if effects are indirect or if effects are direct, loss of a nest site, would be long-term (EPA, 2022).

Goodship & Furness (2022) suggest a breeding season buffer zone of 100-200 m from nest sites for kestrels. In addition, kestrel exhibit a level of tolerance to human related disturbance and for example regularly nest in active quarries. Therefore, unless the existing nest sites shift significantly closer to the footprint of the proposed construction works, it is considered unlikely that there will be indirect disturbance to breeding kestrels during construction.

Kestrels were regularly recorded foraging and flying through the 500 m proposed turbine buffer during baseline surveys and it is considered that construction activities may have momentary effects by occasionally displacing individuals foraging though the area. However, in consideration of kestrels being relatively tolerant to certain kinds of human disturbance, the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on foraging kestrels are assessed as imperceptible and therefore not significant (EPA, 2022).

7.4.2.22 Barn owl - Likely significant Construction Phase Effects

Considering the nocturnal behaviour of barn owls in the context of the discreet nature of proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential indirect effects on foraging barn owls are assessed as imperceptible and therefore not significant (EPA, 2022).

No barn owl breeding sites were identified within the proposed footprint for construction works or within the 500 m proposed turbine buffer. There is potential nesting habitat within the footprint of the proposed construction works, specifically the area of woodland that will be cleared to facilitate construction of the Proposed Project. Considering that barn owls are relatively site faithful there is a limited risk of the resident pair (nest 1.2 km from closest infrastructure) shifting nest site during the build. If this did occur and the pair re-located to a site within the proposed footprint for construction, inappropriately monitored/phased construction works could result in direct or indirect disturbance of breeding barn owls. Therefore, in the absence of mitigation, construction activities have the potential to have displacement effects on 1 pair of barn owl, which are assessed as having county importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect displacement effects on 1 pair, would be moderate: 6-20% (Percival, 2003) given an estimated county breeding population of 10-15 pairs. Based on Percival (2003) taking a medium sensitivity for breeding barn owl and a moderate magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022) if effects are indirect or long-term (EPA, 2022) if effects are direct loss of a nest site.

Reported disturbance thresholds for barn owls are highly variable and as reviewed in Goodship & Furness (2022) the majority of expert opinion is within the range of 30 to 100 m from breeding sites, although values as low as 10 m and as high 250 m were also cited. The reasons for this variability have been recognised as being a function of the nest site characteristics (e.g. building in an active farmyard vs a more isolated site), behavioural traits of

breeding pair (e.g. habituation to human activity) and the type of disturbance activities involved. Barn owls were reported as successfully breeding at a large wind farm under construction in Scotland (Twentyshilling Wind Farm)[23], where nest boxes were provided to maintain breeding sites. Of the two barn owl breeding sites identified during the baseline study, the closest is approximately 1.2 km away from the closet part of the proposed construction footprint, which is beyond the highest disturbance distances reported for breeding barn owl (Goodship & Furness, 2022). Therefore, no direct or indirect effects are anticipated to any existing barn owl sites during construction.

7.4.2.23 Peregrine - Likely significant Construction Phase Effects

Peregrines were not frequently recorded flying through the 500 m proposed turbine buffer during baseline surveys, however construction activities may have momentary effects by occasionally displacing individuals foraging through the area. Taking into consideration that peregrines are relatively tolerant to certain kinds of human disturbance, the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on foraging peregrines are assessed as imperceptible and therefore not significant (EPA, 2022).

There is no suitable nesting habitat within the proposed footprint for construction, therefore there is no potential for direct effects on breeding peregrines. In this region where there are very few nesting opportunities on natural cliff faces, buildings and quarries provide a highly limited resource to breeding peregrines. A nest site was identified within approximately 350 m of the borrow pit in the southern part of the Proposed Project Site.

Goodship & Furness (2022) suggest a breeding season buffer zone of 500-750 m from nest sites for peregrines. However, it is acknowledged that some pairs may be more tolerant of human activity than others and for instance in Ireland peregrines regularly nest in active quarries which inherently generate significant levels of disturbance. The pair nesting adjacent to the Proposed Project Site will be habituated to some level of human activity, as the nest is located next to dwellings and an active farmyard. In addition, as reviewed in Goodship & Furness (2022), the security of the nest, surrounding topography and existing screening effects will play a role in how much of a threat the pair perceive the proposed construction activity to be. In this instance, factors that will limit the magnitude of any disturbance effects include the nest being situated in a very secure position on a high, inaccessible abandoned structure, with a block of woodland and a gradient that slopes downward towards the river and away from the nest site acting to create a screening effect between the nest and works.

With consideration given to a level of habituation and on-site conditions, it is anticipated that disturbance effects to breeding peregrines during construction will be imperceptible to slight (EPA, 2022). However, it is noted that the pair utilising the site has not previously been exposed to the level of disturbance that will occur during construction and birds can exhibit higher sensitivity to low levels of disturbance at critical points over the breeding season. For example, early in the breeding season regular disturbance events causing incubating birds to flush can contribute to reduced productivity and nest failure. Therefore, taking a precautionary approach, habituation and site conditions notwithstanding, inappropriately monitored/phased construction works could result in indirect disturbance effects to breeding peregrines. Therefore, in the absence of mitigation, construction activities have the potential for disturbance effects on 1 pair of peregrine, which are assessed as having county importance (NRA, 2009). The magnitude of population level effect, caused by indirect disturbance effects on 1 pair, would be moderate: 6-20% (Percival, 2003) given an estimated county breeding population of 10-15 pairs. Based on Percival (2003) taking a medium sensitivity for breeding peregrine and a moderate magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term (EPA, 2022).

23 See press release at: Breeding Barn Owl Pair Get New Spring Home (dgwgo.com)

7.4.2.24 Sparrowhawk - Likely significant Construction Phase Effects

This species regularly utilises commercial forestry plantation as breeding sites and sparrowhawk populations are considered relatively tolerant of displacement effects from commercial felling operations. No sparrowhawk nests were identified within the proposed footprint for construction works. There is potential nesting habitat within the proposed footprint for construction works, specifically the areas of woodland that will be cleared to facilitate construction of the Proposed Project. Sparrowhawk often use different nest sites between years and if a resident pairs shifted nest site during the build, inappropriately monitored/phased construction works could result in direct or indirect disturbance of breeding sparrowhawk. There are no published breeding season buffer zones for nesting sparrowhawk, and while this species habituates to human disturbance in urban settings (e.g. Schütz & Schulze, 2018), rural birds are likely to be more sensitive and construction works over the breeding season have the potential to result in disturbance and displacement effects.

Therefore, in the absence of mitigation, construction activities have the potential to have displacement effects on 1 pair of sparrowhawk, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 1 pair, would be low: 1-5% (Percival, 2003) given an estimated county breeding population of 150 pairs. Based on Percival (2003) taking a precautionary low sensitivity[24] for breeding sparrowhawk and a low magnitude effect results in an adverse effect of very low significance on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022).

Sparrowhawk were not frequently recorded flying through the 500 m proposed turbine buffer during baseline surveys. Construction activities may have momentary effects by occasionally displacing individuals foraging though the area. In consideration of the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on foraging sparrowhawks are assessed as imperceptible and therefore not significant (EPA, 2022).

7.4.2.25 Buzzard - Likely significant Construction Phase Effects

Buzzards were regularly recorded foraging through the Proposed Project Site; therefore, it can be assumed that there will be a level of disturbance from certain operations during construction works and it is possible that this will result in the displacement of foraging birds to another area. However, taking into consideration the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on foraging buzzard are assessed as imperceptible and therefore not significant (EPA, 2022).

The Proposed Project Site and associated 2 km proposed turbine buffer supports three pairs of buzzards. One of the breeding sites, located within the T-shaped woodland (south of T04), if occupied would be directly affected by felling operations required to facilitate the proposed infrastructure if this were to take place during the breeding season. However, a single pair of buzzards can have 10 or more alternative nest sites within its breeding season home range, with two to four alternative nests being more typical (Brown & Amadon, 1986). Therefore, as with sparrowhawk, buzzards are considered to be relatively tolerant of felling operations (out of the breeding season) and should readily relocate to an alternative site in the remaining woodland/treelines adjacent to any felled areas.

The effect of inappropriately timed construction works is considered to have the potential direct and/or indirect effects on the local buzzard population. Therefore, in the absence of mitigation, construction activities have the

[24] Note: Technically, based on Percival (2003), sparrowhawk, as species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis; as birds of prey occurring at low densities are susceptible to disturbance at the local population level.

potential to have displacement effects on 1-2 pairs of buzzard, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 1-2 pairs, would be low: 1-5% (Percival, 2003) given an estimated county breeding population of 50-100 pairs. Based on Percival (2003), taking a precautionary low sensitivity[25] for breeding buzzard and a low magnitude effect results in an adverse effect of very low significance on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022).

Goodship & Furness (2022) suggest a breeding season buffer zone of 100-200 m from nest sites for buzzard.

7.4.2.26 Long-eared owl - Likely significant Construction Phase Effects

Considering the nocturnal behaviour of long-eared owls in the context of the discreet nature of proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential indirect effects on foraging long-eared owls are assessed as imperceptible and therefore not significant (EPA, 2022)

Long-eared owls were heard calling from the woodland on the southern boundary of the 500 m proposed turbine buffer and were considered likely to be breeding in the vicinity. The area of woodland in the southern extent of the Proposed Project Site was assessed as providing suitable nesting cover for this species. Inappropriately monitored/phased construction works could result in direct or indirect disturbance of breeding long-eared owl. Therefore, in the absence of mitigation, construction activities have the potential to have displacement effects on 1 pair of long-eared owl, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 1 pair, would be low: 1-5% (Percival, 2003) given an estimated county breeding population of 50-100 pairs. Based on Percival (2003), taking a precautionary low sensitivity[26] for breeding long-eared owl and a low magnitude effect results in an adverse effect of very low significance on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022).

Goodship & Furness (2022) suggest a breeding season buffer zone of 100-300 m from nest sites for long-eared owl.

7.4.2.27 Swift - Likely significant Construction Phase Effects

There are no suitable nesting locations for swift within the Proposed Project Site and the area was only utilised for foraging (up to 25 birds). It is considered highly unlikely that any disturbance factors due to construction activities will negatively affect this species; as swifts typically nest in buildings in busy urban settings and are therefore habituated to high levels of human activity. It is possible that construction activities, such as excavation works may have a highly localised impact on the emerging insect prey taken by swifts. However, given the relatively constrained nature of the works corridor any effects on hatching invertebrates are considered imperceptible. Therefore, in the context of the discreet nature of proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential indirect effects on foraging swifts are assessed as imperceptible and therefore not significant (EPA, 2022).

[25] Note: Technically, based on Percival (2003), buzzard, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as birds of prey occurring at low densities that are susceptible to disturbance at the local population level.
[26] Note: Technically, based on Percival (2003), long-eared owl, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as birds of prey occurring at low densities that are susceptible to disturbance at the local population level.

7.4.2.28 Stock dove - Likely significant Construction Phase Effects

Over the study period there was only one record of an individual bird in the southern woodland noted as possibly breeding within the 500 m proposed turbine buffer. Overall it was noted that arable production was limited in the immediate area, which is likely to limit the occurrence of this species at higher densities. No felling or vegetation removal is proposed in the vicinity of the possible stock dove breeding record. In addition, the location is sufficiently distant (c. 150 m) from proposed construction activities, as well as being screened by mature woodland, and therefore is not considered to be at any risk of indirect disturbance effect.

While not located during the baseline study, breeding stock dove could breed in areas of woodland earmarked for felling to facilitate construction for the Proposed Project. Therefore inappropriately monitored/phased construction works could result in direct or indirect disturbance of breeding stock dove occurring in low densities. In the absence of mitigation, construction activities have the potential to have displacement effects on 1-3 pairs (maximum) of stock dove, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 1-3 pairs, would be negligible: < 1% to low: 1-5% (Percival, 2003), given an estimated county breeding population of 300 pairs. Based on Percival (2003), taking a medium sensitivity for breeding stock dove and a negligible to low magnitude effect results in an adverse effect that is not significant or is of low significance on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022).

7.4.2.29 Red listed passerines –Likely significant Construction Phase Effects

Four species of red listed passerine were recorded within the 500 m proposed turbine buffer, including redwing (wintering), grey wagtail (probable breeding/wintering), meadow pipit (breeding/wintering) and yellowhammer (two pairs).

Wintering redwing may be displaced by construction activities; however, it is considered that there are ample alternative foraging/roosting habitats in the vicinity of the Proposed Project. Therefore, with consideration given to the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on redwings are assessed as imperceptible and therefore not significant (EPA, 2022).

Meadow pipit are a ground nesting species and within the 500 m proposed turbine buffer breeding territories were relatively abundant in area associated with less improved grassland habitat along the River Suir floodplain. In the absence of mitigation, construction activities have the potential to have displacement effects on up to 40 territorial meadow pipits, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 40 birds, would be negligible: < 1% (Percival, 2003), given an estimated county population of 30,000 birds. Based on Percival (2003), taking a medium sensitivity for breeding meadow pipit and a negligible magnitude effect results in an adverse effect that is not significant on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022). Furthermore, the footprint of the proposed construction works largely avoids the more sensitive habitats utilised by breeding meadow pipits and therefore potential for direct disturbance has been minimised. As a widespread and common passerine meadow pipit populations are not considered to be sensitive to localised disturbance and typically relatively small nest site buffers of 20-30 m are generally recommended to protect breeding birds from most construction activities. Wintering meadow pipit may be displaced by construction activities; however, it is considered that there are ample alternative foraging/roosting habitats in the vicinity of the Proposed Project. Therefore, with consideration given to the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on meadow are assessed as imperceptible and therefore not significant (EPA, 2022).

A probable grey wagtail breeding territory was identified along the River Suir and this was where the majority of activity for this riverine species was recorded. Grey wagtail often occupy urban settings and therefore are generally considered relatively tolerant of human disturbance adjacent to watercourses. Grey wagtail utilising the Proposed Project Site are unlikely to be adversely affected by disturbance arising from proposed construction activities; as the area occupied by this species along the River Suir is largely avoided by the footprint of the Proposed Project. Grey wagtail are reliant on aquatic invertebrates (Snow & Perrins, 1998) and can be negatively impacted by deterioration in water quality (e.g. see Rushton et al., 1994 and Larsen et al. 2010). Therefore, in the absence of mitigation there is potential for a pollution event or prolonged sedimentation affecting the invertebrate populations to have a negative impact on 1 pair of grey wagtails utilising the area, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 1 pair, would be negligible: < 1% (Percival, 2003), given an estimated county breeding population of 500 pairs. Based on Percival (2003), taking a medium sensitivity for breeding/wintering grey wagtail and a negligible magnitude effect results in an adverse effect that is not significant on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022). Furthermore, based on the requirements of other ecological sensitivities, best practice mitigation measures will be in place during construction to protect water quality.

Yellowhammer breed at low densities within the 500 m proposed turbine buffer, with only two pairs recorded during the baseline study. Overall it was noted that arable production was limited in the immediate area, which is likely to limit the occurrence of this species at higher densities. Yellowhammer nest in hedgerows and therefore in the absence of mitigation, construction activities have the potential to have displacement effects on 2 pairs (maximum) of yellowhammer, which are assessed as having local (higher value) importance (NRA, 2009). The magnitude of population level effect, caused by direct or indirect effects on 2 pairs, would be negligible: < 1% to low: 1-5% (Percival, 2003), given an estimated county breeding population of 1,000-2,000 birds. Based on Percival (2003), taking a medium sensitivity for breeding yellowhammer and a negligible magnitude effect results in an adverse effect that is not significant on a locally (higher value) important population (NRA, 2009), over the short-term (EPA, 2022). Wintering yellowhammer may be displaced by construction activities; however, it is considered that there are ample alternative foraging/roosting habitats in the vicinity of the Proposed Project. Therefore, with consideration given to the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on yellowhammer are assessed as imperceptible and therefore not significant (EPA, 2022).

7.4.2.30 Amber listed passerines - Likely significant Construction Phase Effects

There were 11 amber listed passerines recorded during the survey period and are assessed as having local (higher value) importance (NRA, 2009). Five species were recorded breeding within the Proposed Project Site, including skylark that nest on the ground in grassland habitats and goldcrest, linnet, spotted flycatcher and willow warbler that breed in a range of different woodland and scrub habitats, including hedgerows and treelines.

Inappropriately timed removal of vegetation within the footprint of the proposed construction works has the potential to result in direct/indirect disturbance to amber listed breeding passerines that nest in scrub, hedgerow, treelines and woodland habitats, within or directly adjacent to the proposed construction works. In terms of population, these species, which although amber listed, are generally considered as relatively common and widespread. For skylark, as is the case for meadow pipits, the footprint of the proposed construction works largely avoids the more sensitive unimproved grassland habitats selected by breeding skylarks and therefore potential for direct disturbance has been minimised. As a widespread and common passerine skylark populations are not considered to be sensitive to localised disturbance. However skylark, are reported as being more sensitive to disturbance than other passerines, with minimum required buffer distances (dependent on activity and mitigating

factors such as landscape) of 100-200 m recommended, as reviewed by Tosh et al. (2014), based on Pearce-Higgins et al. (2009) and Hötker et al. (2006).

Therefore, the magnitude of population level effect, caused by direct or indirect effects on relatively large breeding populations of skylark, goldcrest, linnet, spotted flycatcher and willow warbler, would be negligible: < 1% (Percival, 2003). Based on Percival (2003), taking a low sensitivity for the assemblage of amber listed breeding passerines and a negligible magnitude effect results in an adverse effect that is not significant on locally (higher value) important assemblage of breeding birds (NRA, 2009), over the short-term (EPA, 2022).

Amber listed passerines, both breeding and wintering birds, may be displaced by construction activities; however, it is considered that there are ample alternative foraging/roosting habitats in the vicinity of the Proposed Project. Therefore, with consideration given to the discreet nature of the proposed construction works within the wider landscape and the availability of alternative foraging areas, as well as the short-term nature of the proposed construction works, potential secondary effects on amber listed passerines are assessed as imperceptible and therefore not significant (EPA, 2022).

7.4.3 Summary likely significant effects – construction phase

Prior to consider of mitigation, for the bird species assessed, significant (> 1%) effects during the construction phase were ruled out for the following species: black-headed gull, lesser black-backed gull, whooper swan, shoveler, curlew, mute swan, wigeon, mallard, teal, woodcock and swift; as well as, four red listed species of passerine, including: redwing, meadow pipit, grey wagtail and yellowhammer, and 11 amber listed species of passerine, including: brambling, goldcrest, house martin, house sparrow, linnet, sand martin, skylark, spotted flycatcher, starling, swallow and willow warbler.

7.4.3.1 Construction phase - direct effects

In the absence of mitigation, significant (> 1%) effects during the construction phase due to direct effects were identified for the following avian IEFs:

Breeding birds of prey			
Medium sensitivity species (Percival, 2003):			
Kestrel	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Barn owl	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Sparrowhawk*	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)
Buzzard*	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)
Long-eared owl*	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)

Other non-passerines			
Medium sensitivity species (Percival, 2003):			
Stock dove	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)

7.4.3.2 Construction phase - disturbance/displacement effects

In the absence of mitigation, significant (> 1%) effects during the construction phase due to disturbance and/or displacement effects were identified for the following avian IEFs:

Breeding waders			
High sensitivity species (Percival, 2003):			
Lapwing	Nationally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Medium sensitivity species (Percival, 2003):			
Snipe	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)

Wintering waterbirds			
Medium sensitivity species (Percival, 2003):			
Lapwing	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Golden plover	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Snipe	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Jack snipe*	Locally important (NRA, 2009)	V. low significance (Percival, 2003)	– short-term (EPA, 2022)

Breeding birds of prey			
Medium sensitivity species (Percival, 2003):			
Kestrel	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Barn owl	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Peregrine	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Sparrowhawk*	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)
Buzzard*	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)
Long-eared owl*	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)

Other non-passerines			
Medium sensitivity species (Percival, 2003):			
Stock dove	Locally important (NRA, 2009)	V. low significant (Percival, 2003)	– short-term (EPA, 2022)

7.4.3.3 Construction phase – deterioration in water quality

In the absence of mitigation, significant (> 1%) effects during the construction phase due to deterioration in water quality were identified for the following avian IEFs:

Riverine species			
Medium sensitivity species (Percival, 2003):			
Cormorant	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Kingfisher	Regionally important (NRA, 2009)	Med significance (Percival, 2003)	– short-term (EPA, 2022)
Little egret	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– short-term (EPA, 2022)
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Grey heron*	Regionally important (NRA, 2009)	V. low significance (Percival, 2003)	– short-term (EPA, 2022)

7.4.4 Operational Phase

Operational effects of wind farms are considered as those emanating from the footprint of the development, including turbines, hardstands, access tracks and substation. As the grid connection is underground and avoids any notably sensitive ecological feature, once installed it is considered that there will be no operational impacts due to underground cabling/ducting. Likewise, the turbine delivery route (TDR) does not require assessment under the operational phase, as it will only be utilised during construction.

The proposed operational lifespan for the wind farm is 35 years, therefore for ornithological receptors temporal magnitude of effects over the operational phase of the project are assessed as long-term effects – effects lasting 15 to 60 years (EPA, 2022). As the footprint of the Proposed Project is within a landscape that has been highly modified by agriculture and agroforestry, it is considered that effects, specifically in relation to habitat loss are fully reversible (EPA, 2022).

Sources for effects during the operational phase have the potential to result in both direct effects and indirect (secondary) effects, including:

Likely sources of direct operational phase effects:

- Collisions risk with turbines for birds

Likely sources of secondary operational phase effects:

- Collection/drainage of surface water runoff;
- Operational activities and servicing - though this would be limited to relatively few visits per year and would not be considered to add significantly to existing/background levels of human activity in the area; and
- Displacement effect of operating turbines, including any effects of long-term habitat loss and barrier effects.

Operational Phase - Likely direct effects on ornithological receptors

Direct operational phase effects on birds can occur through mortality caused by collision with the turbines and any associated overhead infrastructure. In this instance all cabling, including cabling associated with the connection to the grid is underground and therefore does not present a collision risk. Some species are considered to be more susceptible to collisions due to flight behaviour. If the frequency of collisions exceed certain levels, the populations of some species may be more sensitive to collision risk, including any associated displacement effects and particular attention is often given to the potential effects of collision risk on some birds of prey and large waterfowl, such as migratory geese and swans (e.g. Hötker et al. 2006, Madders & Whitfield, 2006, Drewitt & Langstone, 2008).

In order to investigate collision risk, a collision risk model (CRM) has been developed by Scottish Natural Heritage (SNH, 2000) sometimes referred to as the Band collision risk model. There are a number of assumptions built into this model and results are improved through a data collection approach employed throughout the baseline surveys, which best facilitates input into the model, specifically time spent by target species at flight heights that may bring them into contact with turbines. The fieldwork approach for the Proposed Project was specifically designed to allow the use of this model. The model has since been updated to take account of avoidance action by birds (SNH, 2010).

All models, and the assumptions they are based on, are open to scrutiny. A study by the British Trust for Ornithology (BTO) on the SNH or Band collision risk model (Chamberlain et al. 2005) found the model to be statistically robust; but lacking with respect to its consideration of avoidance rates. The issue of avoidance rates has since been addressed, although understanding around avoidance is still developing for certain species. It is considered, therefore, that the use of the SNH collision risk assessment model is appropriate for this assessment.

Use of the SNH collision risk model, running data from VP watches over 2-years between October 2021 and September 2023 inclusive, provided outputs relating to predicted collisions for a range of target species recorded within the 500 m proposed turbine buffer. Details of methodology and assumptions are provided in Appendix 7H, which outlines the parameters inputted into the CRMs undertaken. A summary of predicted collision risk is provided in Table 7-9, which gives weighted values (adjusted to correct for overlapping viewsheds, turbine downtime and seasonal bird activity), with appropriate species-specific avoidance rates applied.

Operational phase - Likely secondary effects on ornithological receptors

In the absence of mitigation measure, deterioration in water quality due to increased runoff and sedimentation as a result of the development has the potential to impact on birds reliant on aquatic habitats, such as kingfisher and grey wagtail, if occurring in the environs. During the operational phase of the project the main pollution risk to the aquatic environment is from suspended solids entering local watercourses. The factors that determine the extent of downstream effects caused by suspended solids are complex and highly dynamic, being dependent on a range of interacting factors, such as rainfall, channel flow characteristics and the amount and sizes of particulate matter within surface water runoff. Considering dilution and dispersion effects between source and receptor, any

potential significant effects due to sedimentation are likely to be relatively localised. However, applying the precautionary principal and in the absence of mitigation, it is considered that the Proposed Project has the potential to result in likely significant effects on downstream ornithological receptors, and in particular those reliant on fish or aquatic invertebrate as prey items.

Long-term loss of habitat due to the infrastructural footprint of the Proposed Project may result in displacement effects or loss of resources for breeding, roosting or foraging birds, especially if constructed within important habitats with a limited distribution or availability, such as wetlands.

Potential secondary effects on birds during the operational phase can be due to disturbance/displacement from operational activities and servicing. However, disturbance levels due to service visits would be limited to relatively few visits per year and would not be considered to add significantly to existing/background levels of human activity in the area. There is evidence that for some bird species operational turbines result in a displacement effect, e.g. Pearce-Higgins et al. (2009), Wilson et al. (2015). The structure of the habitat is not affected; however the area surrounding a turbine becomes unavailable to foraging, roosting and/or breeding birds due to the perceived threat of the operational turbine, be that noise or movement of rotating blades. The duration of the disturbance/displacement effect may be short-term and there is evidence that some species, while initially displaced during construction, become habituated to operational turbines and over time return to pre-construction densities. Turbines could also have more complex transient disturbance/displacement effects caused by operational conditions, e.g. any displacement effects due to noise are likely to be more pronounced over periods with higher wind speeds when turbines are rotating faster, and windshear creates louder noise levels.

Wind farms can create a significant barrier effects on birds moving through an area, especially if located on a migration route or between foraging and roosting/breeding habitats. Barrier effects are a form of displacement typically considered for large arrays of turbines spread over a wider geographic area or concentrated in an important location, e.g. on an important migration route (Humphreys et al. 2015). In response to novel objects birds will adjust flight paths and/or flight heights to avoid the perceived threat. For birds on migration or making daily flights between foraging and roosting/breeding sites, taking this detour is likely to have energetic costs with the potential to affect condition, including reproductive fitness (e.g. Marden et al., 2009). Considered in isolation, the dimension and spacing of the turbine array for the Proposed Project, i.e. 10 turbines clustered over c. 2.5 km by c. 1.7 km at its widest (five turbines by one to four turbines), does not form an excessively elongated or dense barrier effect to bird populations utilising or moving through the area. The Proposed Project was not found to be on a significant migration route or regularly utilised flight line between any roosting/breeding sites and foraging areas. The location of the wind farm on the River Suir does have the potential for displacement effects (minor barrier effects) on species moving up and downstream along the river that may have to re-route flight paths to avoid the turbines. The only species found to be utilising the River Suir in this manner were cormorants and any operational effects on flight behaviour is discussed under displacement effects. Given the relatively limited extend of the turbine cluster being assessed, no likely significant effects are anticipated to arise due turbines having barrier effects and any effects on bird flight paths are considered under displacement effects in the following sections.

7.4.4.1 Designated Sites – Likely operational phase effects

As detailed in **Appendix 7A**: Section 7A.2.2.1 and Section 7A.2.2.2, the Proposed Project is not located within or directly adjacent to any Natura 2000 site (SAC/SPA), nationally designed site (NHA) or proposed conservation site (pNHA). Therefore, the operational phase of the Proposed Project will not directly impact on any sites designated for nature conservation.

As fully detailed in the desk study presented in **Appendix 7A**, the only designated site where potential ornithological source-pathway-receptor linkage were identified between the Proposed Project Site and avian

features of interest was for the southern part of the Cabragh Wetlands pNHA. The Proposed Project Site and the Cabragh Wetlands are considered likely to contribute, along with other locations, to supporting a relatively mobile wintering waterbird population of county (regional) importance. Once operational the Proposed Project has the potential for disturbance effects on wintering waterbirds and associated displacement effects could result in reduced usage or abandonment of the Proposed Project Site. The Cabragh Wetlands, which is a site managed for wintering waterbirds, could act as a sink for any bird populations that may be displaced during the operational phase. Detailed species impact assessments are provided in the following sections; however in terms of indirect effects on the Cabragh Wetlands pNHA, it can be concluded that as this pNHA is specifically managed as a wetland to support wintering waterbirds any potential influx of birds due to displacement over the operational phase of the project will be imperceptible and not significant (EPA, 2022).

7.4.4.2 Lapwing– Likely operational phase effects

Breeding and wintering lapwing - Operational habitat loss

The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of habitats utilised by breeding lapwing. Foraging habitats along the River Suir utilised by wintering flocks are also avoided. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Breeding lapwing - Operational disturbance/displacement

As reviewed in Mc Guinness et al. (2015), studies on lapwing populations breeding in the vicinity of operational turbines "*have found no discernible impact on populations of breeding Lapwings, either through collision, disturbance displacement or avoidance*". There are some studies where displacement effects have been detected and for instance, Steinborn & Reichenbach (2011) found that while lapwing bred within wind farm sites, there were displacement effects of up to 100 m. This finding fits with the mean disturbance distance of 108 m, as reviewed in Hötker et al. (2006), where a maximum disturbance distance for breeding lapwing of 350 m is reported. This species often breeds successfully within modern, intensive agricultural landscapes, e.g. regularly nest and forage within tillage, with pairs often nesting/foraging/loafing near relatively busy roads, and therefore, are assessed as being relatively tolerant of discrete developments/disturbance factors and likely to habituate to wind turbines.

A maximum estimated breeding population of 6 pairs of lapwing have been recorded within the 500 m proposed turbine buffer. As shown in Figure 7G.1 (Appendix 7G), the baseline study identified two breeding areas, one located on the western bank of the River Suir, north of the Rossestown Bridge; and the other to the east, associated with a second order tributary of the River Suir. On-site habitat conditions during the baseline study were assessed as sub-optimal for breeding lapwing and this population was struggling to breed successfully.

All the proposed turbines are located more than 100 m away from both areas where lapwing breeding activity was recorded. As listed in Table 7-11, the closest turbines to the western breeding area are T07, T03, T08, T06 and T02 located at distances of c. 250 m, c. 270 m, c. 295 m, c. 300 m, c. 370 m, respectively, with all the other turbines located > 0.5 km away. As listed in Table 7-11, the closest turbines to the eastern breeding area are T05, T07 and T03, located at distances of c. 125 m, c. 195 m and c. 380 m, respectively, with all the other turbines located > 0.5 km away.

Applying a precautionary approach, in the absence of mitigation (habitat enhancement measures), the operational phase of the Proposed Project has the potential to cause the long-term displacement of 6 pairs of lapwings, which are assessed as nationally important (NRA, 2009). The magnitude of population level effect, caused by displacement of 6 pairs, would be low: 1-5% (Percival, 2003), given a national breeding population of 476 to 620 pairs (NPWS, 2019). Therefore, based on Percival (2003) taking a high sensitivity for breeding lapwing and a low magnitude effect results in an adverse effect of low significance on a nationally important population (NRA, 2009), over the long-term (EPA, 2022).

Wintering lapwing - Operational disturbance/displacement

Post-construction studies for wind farm sites supporting wintering lapwing populations comparable with the Proposed Project (e.g. Percival et al., 2008, 2018a), indicate that sensitivity of wintering lapwing to disturbance and/or displacement effects from operational turbines is minimal and this species exhibits high levels of micro-avoidance towards turbines. Therefore, it is anticipated that lapwing flocks will continue to utilise the area along the River Suir during the operational phase of the Proposed Project. The positioning of proposed turbines avoids key habitats along the River Suir floodplain that are periodically utilised by foraging birds. Likewise, the proposed layout largely avoids core flock flying and commuting routes along the River Suir, north of Rossestown Bridge and in the northwestern part of the 500 m proposed turbine buffer at Clonamuckoge Beg/Kilkillahara.

Over the baseline study peak winter counts of 160-500 lapwing were recorded. During the non-breeding season the Proposed Project Site is used by lapwing commuting through the area and is also periodically utilised by foraging/loafing birds and this behaviour appears to be strongly linked to on-site conditions, such as the occurrence of flooding. Wintering flocks are highly mobile, utilising a number of other locations in the wider area and are not wholly reliant on the Proposed Project Site.

The wintering population of lapwing occurring within the Proposed Project is classified as being of county importance, as an area regularly supporting more than 20-30 birds. A highly precautionary assessment finds that the operational phase of the Proposed Project has the potential to displace wintering lapwing, which utilise the Proposed Project Site periodically in numbers of county importance (NRA, 2009). Assuming the displacement effects are absolute, the magnitude of population level effect caused by displacement of 200-500 birds would be moderate: 6-20% (Percival, 2003), given a regional wintering population estimated at 2,000-3,000 birds. Therefore, based on Percival (2003) taking a medium sensitivity for wintering lapwing and a moderate magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the long-term (EPA, 2022). As noted, this assessment is highly precautionary and the magnitude of effect can be downgraded to low: 1-5% and possibly negligible: < 1% (Percival, 2003), giving consideration to, the low behavioural sensitivity of lapwing to operational turbines, i.e. lapwing exhibit micro-avoidance of turbines and are likely to continue utilising the area post-construction. In addition, as the regional wintering lapwing population is not wholly reliant on the Proposed Project Site, and in the context of a highly mobile population with access to alternative foraging sites in the wider area, any macro-avoidance (displacement) effects, if occurring, e.g. over the short-term while wintering birds habituate to the operational turbines, displacement is unlikely to result in any discernible population level effects.

Table 7-11: Distances from lapwing breeding areas to proposed turbine locations

Turbine	Dist. from western area	Direction	Dist. from eastern area	Direction
T01	770 m	WNW	1.5 km	WNW
T02	370 m	NW	990 m	WNW
T03	270 m	East	380 m	WNW
T04	980 m	NE	695 m	NNW
T05	800 m	ENE	125 m	North
T06	300 m	West	1.0 km	West
T07	250 m	ESE	195 m	West
T08	295 m	SSW	700 m	WSW
T09	585 m	SSE	585 m	SW
T10	1.2 km	SSE	1.1 km	SW

Lapwing - Collision risk

The species account for lapwing (Section 7.3.4.8) tested the magnitude of effect for predicted collision risk on the wintering and breeding lapwing populations utilising the 500 m proposed turbine buffer – see Table 7-9. Outputs applying default avoidance (98%) were rejected and population level effects were assessed applying a still very precautionary level of avoidance (99.5%) for Turbine Type B[27]. There are records of lapwing collisions at wind farms, e.g. see Dürr (2023); however several post-construction monitoring studies for sites with breeding and wintering lapwing, e.g. Percival et al. (2009, 2018a, 2018b) indicate that turbine mediated fatalities for both components of the population are exceptional low. Therefore, the application of higher avoidance rates would be more appropriate for lapwing CRMs and these studies suggest avoidance as high as 99.9% should be tested (Percival, 2018a).

As fully detailed in Section 7.3.4.8, the outputs from lapwing CRMs, assessed at an intermediate avoidance rate (0.995) indicates that collision risk over the breeding season has the potential for low level (c. 1%) effect on the lapwing breeding in the area. Similarly for wintering lapwing applying intermediate avoidance rate (0.995), outputs for predicted collision risk indicates that any population level effects would be expressed at the local population level and the magnitude of effect is anticipated to be low (1-5%).

Breeding lapwing – collision risk

To test the magnitude of effect on the lapwing breeding population, an annual adult survival rate of 0.71 (BTO BirdFacts[28]) is applied to the low and high all-Ireland lapwing breeding population estimates of 952 to 1,240 birds (NPWS, 2019), and the local breeding population of 12 birds. Applying 0.03 collisions per annum for breeding season predicted collision risk, based on the intermediate (99.5% avoidance) output from the 2023 breeding season, which accounts for highest levels of flight activity recorded over the study period, would express an effect of c. 1% of background mortality.

Therefore, based on Percival (2003) taking a high sensitivity for breeding lapwing and a low magnitude effect, due to predicted collision risk, results in an adverse effect of low significance on a nationally important breeding population (NRA, 2009), over the long-term (EPA, 2022).

Wintering lapwing – collision risk

Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.71 (BTO BirdFacts[29]) to the all-Ireland lapwing wintering population of 84,690 birds (Lewis et al. 2019b), an estimated county/regional wintering population of 2,000-3,000 birds (estimated using I-WeBS data) and a local population of 200-500 birds.

Taking an intermediate modelled output for predicted annual lapwing collision risk of 2.51 collisions per annum (precautionary, 99.5% avoidance for Turbine Type B), any additional mortality due to predicted collision risk would have a less than 1% effect on the all-Ireland population (0.01%, excluding cumulative effects) and the county population (0.29-0.43%). In terms of the local lapwing population (200-500 birds) regularly utilising the Proposed Project Site over the winter, applying the intermediate modelled output for predicted lapwing collision risk, 2.51 collisions per annum, would express an effect > 1% above background mortality, ranging from 1.7 to 4.3% depending on the size of the local population assessed.

Therefore, based on Percival (2003) taking a medium sensitivity for wintering lapwing and a low magnitude effect, due to predicted collision risk, results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the long-term (EPA, 2022).

[27] Operational parameters set at rotational period: 6.85 seconds & pitch: 6°, with aggregate flight time within CRZ: 25-180 m
[28] BTO BirdFacts – Lapwing: https://www.bto.org/understanding-birds/birdfacts/lapwing
[29] BTO BirdFacts – Lapwing: https://www.bto.org/understanding-birds/birdfacts/lapwing

7.4.4.3 Golden plover– Likely operational phase effects

Wintering golden plover - Operational habitat loss

The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of foraging habitats along the River Suir utilised by wintering golden plover. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Wintering golden plover - Operational disturbance/displacement

A review of wind farm impacts in Germany by Hötker et al., (2006) includes information on minimum disturbance distances for wintering golden plover at 22 wind farms sites. For these wind farms, the following minimum disturbance distances are given: 50 m (six sites), 150 m (nine sites), 250 m (4 sites), 350 m (2 sites) and 850 m (one site). The mean minimal displacement distance was 135 m (median 175 m) and the large variation in range was explained by habitat availability on a site-by-site basis. This indicated that if displaced non-breeding birds move to the nearest suitable habitat patch; and therefore, as was the case for the site with the 850 m displacement effect, if the wind farm occupies a significant proposition of the suitable habitat, then birds are likely to be displaced to suitable areas further afield. Hötker et al., (2006) also noted that at three out of four study sites, golden plover demonstrated increasing habituation to turbines over time.

Post-construction studies for wind farm sites supporting wintering golden plover populations comparable with the Proposed Project (e.g. Percival et al., 2008, 2018a), indicate that sensitivity of wintering golden plover to disturbance and/or displacement effects from operational turbines is minimal and this species exhibits high levels of micro-avoidance towards turbines. Therefore, it is anticipated that golden plover flocks will continue to utilise the area along the River Suir during the operational phase of the Proposed Project. The positioning of proposed turbines avoids key habitats along the River Suir floodplain that are periodically utilised by foraging birds. Likewise, the proposed layout largely avoids core flock flying and commuting routes along the River Suir, north of Rossestown Bridge and in the northwestern part of the 500 m proposed turbine buffer at Clonamuckoge Beg/Kilkillahara.

Over the baseline study peak winter counts of 200-700 golden plover were recorded. During the non-breeding season the Proposed Project Site is used by golden plover commuting through the area and is also periodically utilised by foraging/loafing birds and this behaviour appears to be strongly linked to on-site conditions, such as the occurrence of flooding. Wintering flocks are highly mobile, utilising a number of other locations in the wider area and are not wholly reliant on the Proposed Project Site. In addition, prior to the baseline study, I-WeBS data suggests that the occurrence of golden plover was more sporadic.

The wintering population of golden plover occurring within the Proposed Project is classified as being of county importance, as an area regularly supporting more than 30-50 birds. A highly precautionary assessment finds that the operational phase of the Proposed Project has the potential to displace wintering golden plover, which utilise the Proposed Project Site periodically in numbers of county importance (NRA, 2009). Assuming the displacement effects are absolute, the magnitude of population level effect caused by displacement of 200-700 birds would be moderate: 6-20% (Percival, 2003), given a regional wintering population estimated at 3,000-5,000 birds. Therefore, based on Percival (2003) taking a medium sensitivity for wintering golden plover and a moderate magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the long-term (EPA, 2022). As noted, this assessment is highly precautionary and the magnitude of effect can be downgraded to low: 1-5% and possibly negligible: < 1% (Percival, 2003), giving consideration to, the low behavioural sensitivity of golden plover to operational turbines, i.e. golden plover exhibit micro-avoidance of turbines and are likely to continue utilising the area post-construction. In addition, as the regional wintering golden plover population is not wholly reliant on the Proposed Project Site, and in the context of a highly mobile population with access to alternative foraging sites in the wider area, any macro-avoidance (displacement) effects,

if occurring, e.g. over the short-term while wintering birds habituate to the operational turbines, any displacement effects are unlikely to result in any discernible population level effects.

Wintering golden plover - Collison risk

The species account for golden plover (Section 7.3.4.9) tested the magnitude of effect for predicted collision risk on the wintering golden plover populations utilising the 500 m proposed turbine buffer. Outputs applying default avoidance (98%) were rejected and population level effects were assessed applying a still very precautionary level of avoidance (99.5%) for Turbine Type B[30] - see Table 7-9.

Collision risk for wader species, including golden plovers are generally considered to be low due to manoeuvrability in flight (Mc Guinness et al., 2015). In terms of turbine mediated mortality Hötker et al. (2006) assessing 127 wind farms across Europe only cites four golden plover collisions; however, this review does not control for survey effort, scavenging rates or surveyor detection rates. A dedicated study systematically searching turbines for victims of collisions undertaken at wind farms on a busy bird migration route in northern Germany (Fehmarn), detected a total of three golden plover fatalities (Grünkorn, 2011 & 2015). While there are records of golden plover collisions at wind farms, e.g. see Dürr (2023); several post-construction monitoring studies for sites supporting wintering golden plover, e.g. Percival et al. (2009, 2018a, 2018b) indicate that turbine mediated fatalities for wintering birds are exceptionally low. Therefore, the application of higher avoidance rates would be more appropriate for golden plover CRMs and these studies suggest avoidance as high as 99.99% should be tested (Percival, 2018a).

As fully detailed in Section 7.3.4.9, potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.73 (BTO BirdFacts[31]) to the all-Ireland golden plover wintering population of 92,060 birds (Lewis et al., 2019b), an estimated county/regional wintering population of 3,000-5,000 birds (estimated using I-WeBS data) and a local population of 200-700 birds.

Taking an intermediate modelled output for predicted annual golden plover collision risk of 4.28 collisions per annum (precautionary, 99.5% avoidance for Turbine Type B), any additional mortality due to predicted collision risk would have a less than 1% effect on the all-Ireland population (0.02%, excluding cumulative effects) and the county population (0.3-0.5%). In terms of the local golden plover population (200-700 birds) regularly utilising the Proposed Project Site over the winter, applying the intermediate modelled output for predicted golden plover collision risk, 4.28 collisions per annum, would express an effect > 1% above background mortality, ranging from 2.3 to 7.9% depending on the size of the local population assessed.

Therefore, based on Percival (2003) taking a medium sensitivity for wintering golden plover and a low (1-5%) to moderate (6-20%) magnitude effect, due to predicted collision risk, results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the long-term (EPA, 2022). If applying avoidance of 99.99%, as suggested by Percival (2018a), predicted collision risk outputs are lowered substantially to 0.15 collisions per annum, equivalent to 3 collisions over 35 years, which would have a negligible (< 1%) effect on the local golden plover population (200-700 birds).

7.4.4.4 Snipe – Likely operational phase effects

Breeding and wintering snipe - Operational habitat loss

The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by breeding and wintering snipe. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

[30] Operational parameters set at rotational period of 6.85 seconds and pitch at 6°, with aggregate flight time within CRZ: 25-180 m
[31] BTO BirdFacts – Golden plover: https://www.bto.org/understanding-birds/birdfacts/golden-plover

Breeding snipe - Operational disturbance/displacement

A study by Pearce-Higgins et al. (2009) found that snipe utilise habitat within 400 m of turbines less than expected and suggested that breeding snipe densities may be reduced by up to 48% within 500 m of operational turbines. However, there are studies suggesting that breeding birds may habituate over time and breeding densities within the 500 m proposed turbine buffer return to or exceed baseline densities, e.g. Percival et al. (2016a & 2018c). For one of these wind farm projects, although not explicitly stated, snipe may have benefited from on-site management which included drain blocking.

Snipe were recorded breeding within the 500 m proposed turbine buffer. It is estimated that there are up to six territories within the 500 m proposed turbine buffer, located in three areas, as shown in Figure 7G.1 (Appendix 7G), including the wetland adjacent to T02 (4 territories in 2021, 1-2 territories in 2022), field on east of River Suir associated with a second order tributary (2 territories in 2021, 3-4 territories in 2022) and a wetland in southeast of 500 m proposed turbine buffer (1 possible territory in 2022). As a site supporting six territories the area has been assessed as a population of county importance.

Based on the findings of Pearce-Higgins et al. (2009), a 400 m proposed turbine buffer is used to assess turbine proximity to snipe breeding areas. As listed in Table 7-12, there are three turbines within 400 m of the western breeding area, including T02, T03 and T06, which are located at distances of 50 m, 320 m and 400 m, respectively with all the other turbines located > 0.5 km away. As listed in Table 7-12, there are three turbines within 400 m of the eastern breeding area, including T05, T07 and T03, which are located at distances of 100 m, 190 m and 200 m, respectively, with all the other turbines located > 0.5 km away. The closest turbine to the southeastern breeding area is T10, which is approximately 0.5 km away and therefore this possible breeding area is unlikely to be affected by the Proposed Project.

Applying a precautionary approach, in the absence of mitigation (habitat enhancement measures), the operational phase of the Proposed Project has the potential to cause the long-term displacement of 5 pairs of snipe, which are assessed as being of county importance (NRA, 2009). The magnitude of population level effect, caused by displacement of 5 pairs, would be low: 1-5% (Percival, 2003), given a notional estimated regional breeding population of 150 pairs. Therefore, based on Percival (2003) taking a medium sensitivity for breeding snipe and a low magnitude effect results in an adverse effect of low significance on a population of county importance (NRA, 2009), over the long-term (EPA, 2022).

Wintering snipe - Operational disturbance/displacement

The Proposed Project Site is considered to support wintering snipe in numbers of county importance, with a peak count of 36 birds recorded. Over the winter the Irish snipe population is bolstered by a significant influx of overwintering European birds and while both the wintering and breeding populations have an unfavourable (red listed) conservation status (Gilbert et al., 2021), there are still unrestricted bag limits on taking wintering snipe, suggesting there is less concern with this component of the population. Out of the breeding season snipe are more mobile and being less restricted to specific habitat types can move more freely to exploit a range of resources. Therefore, the magnitude of any displacement effects on wintering birds will be less compared to potential displacement effects on breeding snipe, which are constrained to breeding territories.

There may be some localised displacement effects on wintering snipe utilising habitats at proposed turbine locations. Reduced utilisation of suitable foraging/roosting habitats around turbines is unlikely to extend > 80-100 m from the turbine base. As alternative foraging and roosting habitats within and adjacent to the Proposed Project Site are not a limiting factor, any localised displacement will have an imperceptible effect on the regional snipe population. Based on Percival (2003), the magnitude of effect of localised, operational displacement on a wintering snipe population of county importance (NRA, 2009) is assessed as negligible (< 1%), and therefore, not significant.

Table 7-12: Distances from snipe breeding areas to proposed turbine locations

Turbine	Dist. from western area	Direction	Dist. from eastern area	Direction	Dist. from SE area	Direction
T01	610 m	West	1.3 km	West	2.5 km	NW
T02	50 m	NW	800 m	WNW	2.3 km	NW
T03	320 m	East	200 m	WNW	1.9 km	NNW
T04	860 m	NE	515 m	North	2.5 km	North
T05	845 m	East	100 m	East	1.9 km	North
T06	400 m	SW	950 m	West	1.9 km	NW
T07	630 m	SE	190 m	SSW	1.5 km	NNW
T08	725 m	South	745 m	SW	1.4 km	NW
T09	1.0 km	SSE	760 m	SSW	1.0 km	NW
T10	1.7 km	SSE	1.3 km	SSW	530	WNW

Snipe - Collision risk

It is acknowledged that VP watch data applied in CRMs for smaller, evasive species like snipe may not provide an accurate estimate of predicted collision risk (Humphreys et al., 2015, updated 2017d). Snipe are a difficult species to detect over the full extent of the viewsheds for VPs, due to diminutive size, cryptic nature and flight behaviour, including having a high proportion of crepuscular/nocturnal activity. Although snipe were present year round, a CRM was only run for wintering flight activity, as during the breeding season only 10 seconds of flight activity was recorded within the CRZ. It is considered that breeding season flight activity was under recorded, as VP locations were relatively distant from the areas utilised by breeding snipe.

The CRM for wintering snipe found that predicted collision risk was low, with only 1 collision every 93 years (Turbine Type B - weighted, 98.0% avoidance). Including a 25% allowance of night flights within the model, still generated a low output, with only 1 collision every 74 years (Turbine Type B - weighted, 98.0% avoidance). While there is uncertainty around the use of CRMs for snipe (Madder & Whitfield, 2006; as reviewed in Humphreys et al., 2015, updated 2017d) the level of turbine mediated mortality reported for snipe is relatively low (Hötker et al, 2006, Dürr, 2023), notwithstanding the obvious difficulty of finding fallen birds which may limit detection rates. As outlined in the previous sections evidence for displacement effects suggests this may be more of a concern for this species, than collision risk, and in this instance displacement of breeding birds in particular.

The species account for snipe (Section 7.3.4.13) tests the thresholds for collision risk required to exert a low (1-5%) magnitude population level effect (Percival, 2003). For a local population of 12 breeding birds this would require 2-11 collisions over the 35 year life span of the Proposed Project. In order to generate this level of predicted collision risk within the CRM would only require a 4 to 22 fold increase in flight time recorded with the CRZ, i.e. an increase from c. 500 seconds to c. 2,000-11,000 seconds. Correcting for the assumed under recording of snipe flight activity during VP watches, it is considered plausible that actual flight time falls somewhere within this adjusted range (2,000-11,000 seconds). Therefore, based on Percival (2003) taking a medium sensitivity for snipe and a low magnitude effect based on predicted collision risk (as corrected), likely significant effect is assessed as an adverse effect of low significance on a population of county importance (NRA, 2009), over the long-term (EPA, 2022).

Compensatory measures are required to offset any displacement effects on breeding snipe and predicted collision risk.

7.4.4.5 Black-headed gull – Likely operational phase effects

Black-headed gull - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by black-headed gulls that will be lost to the infrastructural footprint of the Proposed Project. The utilisation of the Proposed Project Site by this species is linked to management practice in improved grassland, including mowing of silage and spreading of slurry, and was also influenced by flooding along the River Suir. Although improved grassland will be lost to the project, there is widespread availability of grassland in the area and the Proposed Project will not influence localised flooding. Therefore, in view of the extensive foraging ranges employed by black-headed gulls, the wide availability of alternative foraging locations and as this population are not wholly reliant on the Proposed Project Site, no likely significant effects will occur as a result of long-term habitat loss.

Black-headed gull - Operational disturbance/displacement

Post-construction studies, e.g. Percival et al. (2018a, 2018b), have found no detectable displacement of black-headed gull from around the operational turbines. These studies did find significantly reduced flight activity within 200 m of turbines and higher activity 200-700 m from turbines, suggestive of very localised displacement for flying birds. Flight density within the 0-200 m zone was estimated to be reduced by 65%, with no evidence of any reductions beyond 200 m.

The wintering population of black-headed gulls utilising the Proposed Project Site was assessed as being of county importance, whereas during the breeding season the reduced usage of the area and no ecological linkages to breeding sites, means the population was assessed as having local (higher value) importance. Across three winters of monitoring, black-headed gulls were regularly recorded in most months, within or directly around the Proposed Project Site, with peak monthly counts ranging from 2 to 80 birds, and a maximum count of 200 birds recorded on one survey day. Across three breeding seasons of monitoring black-headed gulls were observed less frequently than over the winter months, and the numbers recorded was also lower, ranging from 1 to 4 birds, and a maximum count of 8 birds recorded on one survey day.

In view of the apparent low behavioural sensitivity of black-headed gulls to operational turbines, i.e. black-headed gulls exhibit micro-avoidance of turbines, birds are likely to continue utilising the area post-construction. In addition, black-headed gulls are not wholly reliant on the Proposed Project Site, and in the context of a highly mobile population with access to alternative foraging sites in the wider area, any macro-avoidance (displacement) effects, if occurring, e.g. over the short-term while birds habituate to the operational turbines, are unlikely to result in any discernible population level effects. Based on Percival (2003), the magnitude of effect for localised, operational displacement on the black-headed gull population, classed as being of county importance (NRA, 2009) during the winter and local (higher value) importance (NRA, 2009) over the breeding season. is assessed as negligible: < 1%, and therefore, not significant.

Black-headed gull - Collision risk

Black-headed gulls feature relatively highly on the list of species recorded as victims of turbine mediated mortality (e.g. Dürr, 2023), and this is likely to be a function of this species being abundant across a wide range of landscapes, as well as fallen birds being easy to detect. As discussed in the previous section, black-headed gulls appear to exhibit high levels of avoidance to operational turbines, and therefore, it is likely that CRMs generate overestimates for predicted collision risk. Based on post-construction monitoring, including turbine searches for carcasses, Percival et al. (2018a) suggest that avoidance should be increased from 99.2% (Furness, 2019) to 99.9%.

The CRM for black-headed gull was run allowing for year-round utilisation of the 500 m proposed turbine buffer and found that predicted collision risk was very low, with only 1 collision every 128 years (for Turbine Type B - weighted, 99.2% avoidance). This level of turbine mediated mortality was reflective of low usage of the site at flight heights within the CRZ and would be totally imperceptible to background mortality. Therefore, no significant

population level effects are anticipated based on the measured level of predicted collision risk for the Proposed Project Site. Based on Percival (2003), taking a medium sensitivity for black-headed gulls and the magnitude of effect for predicted collision risk as negligible: < 1%, results in an assessment of not significant.

7.4.4.6 Lesser black-backed gull – Likely operational phase effects

Lesser black-backed gull - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by lesser black-backed gulls that will be lost to the infrastructural footprint of the Proposed Project. The utilisation of the Proposed Project Site by this species is linked to management practice in improved grassland, including mowing of silage and spreading of slurry, and was also influenced by flooding along the River Suir. Although improved grassland will be lost to the project, there is widespread availability in the area and the Proposed Project will not influence localised flooding. Therefore, in view of the extensive foraging ranges employed by lesser black-backed gulls, the wide availability of alternative foraging locations and as this population are not wholly reliant on the Proposed Project Site, no likely significant effects will occur as a result of long-term habitat loss.

Lesser black-backed gull - Operational disturbance/displacement

The wintering population of lesser black-backed gull utilising the Proposed Project Site was assessed as being of county importance, whereas during the breeding season the reduced usage of the area and no ecological linkages to breeding sites means the population was assessed as having local (higher value) importance.

As reviewed in Furness (2013), Cook et al. (2014) and Humphrey et al. (2015), post-construction studies investigating attraction/displacement of gull species to operational offshore turbines found that behavioural responses varied for lesser black-backed gull, with displacement, attraction and no response all noted. Percival et al. (2018b) undertaking post-construction monitoring at an onshore wind farm found a pronounced reduction of flight activity within 100 m of turbines for lesser black-backed gulls and no evidence of any significant drop off in flight activity (displacement) beyond 100 m. Flight activity reduced by 49% within 100 m of turbines, when compared to flight activity recorded within 500 m-1 km of turbines.

In view of the apparent low behavioural sensitivity of lesser black-backed gulls to operational turbines, i.e. lesser black-backed gulls exhibit micro-avoidance of turbines, birds are likely to continue utilising the area post-construction. In addition, as lesser black-backed gulls are not wholly reliant on the Proposed Project Site, and in the context of a highly mobile population with access to alternative foraging sites in the wider area, any macro-avoidance (displacement) effects, if occurring, e.g. over the short-term while birds habituate to the operational turbines, are unlikely to result in any discernible population level effects. Based on Percival (2003), the magnitude of effect of localised, operational displacement on the lesser black-backed gull population (classed as being of county importance (NRA, 2009) during the winter and local (higher value) importance (NRA, 2009) over the breeding season) is assessed as negligible: < 1%, and therefore, not significant.

Lesser black-backed gull - Collision risk

Lesser black-backed gulls can feature relatively highly on the list of species recorded as victims of turbine mediated mortality, e.g. Everaert (2003) and Krijgsveld et al. (2011a & 2011b), especially at sites where activity is high due to frequent commuting flights through the turbine array, e.g. from breeding colonies or large roosting areas to foraging sites. This level of flight activity was not recorded at the Proposed Project Site, where lesser black-backed gulls, while regularly occurring in the general area, were not always present within the 500 m proposed turbine buffer and numbers recorded were also relatively low, typically < 40 birds recorded over the winter and < 15 birds during the breeding season, with a maximum count of 70 birds recorded.

The CRM for lesser black-backed gull was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 3.2 years (weighted,

99.5% avoidance), equivalent to 11 collisions over 35 years. Examination of the temporal distribution of flight time over the two year study found that flight activity was different between the study years, with October 2021 to August 2022 generating significantly higher values when compared with October 2022 to August 2023. Therefore, the model was re-run for the year exhibiting highest levels of flight activity only, which found that predicted collision risk almost doubles to one collision every 1.6 years (weighted, 99.5% avoidance), equivalent to 22.4 collisions over 35 years.

Assuming the Proposed Project does not have a displacement effect on lesser black-backed gulls, taking the worst-case scenario for predicted collision risk, (0.64 collisions/year), indicates that any population level effects would be expressed at the county population and local population level, with the magnitude of effect estimated at low (1.5%) and moderate (7.4%), respectively, as fully detailed in the species baseline account (Section 7.3.4.21). Therefore, based on Percival (2003) taking a medium sensitivity for lesser black-backed gull and a low (1-5%)/moderate (6-20%) magnitude effect, due to predicted collision risk, results in an adverse effect of low significance on regionally (wintering) /locally (breeding season) important populations (NRA, 2009), over the long-term (EPA, 2022). This assessment is considered precautionary, based on population viability analysis (PVA) conducted for the Alde-Ore Estuary lesser black-backed gull population (APEM, 2013 and MacArther Green, 2019), which suggests that levels of additional mortality required to have any discernible effect on the regional population, i.e. induce population decline, would need to be substantially higher than a 1% additional effect on background mortality. This finding is supported by a population modelling for a North Sea lesser black-backed gull population (Potiek et al., 2019).

7.4.4.7 Cormorant – Likely operational phase effects

Cormorant - Operational habitat loss

The focus of cormorant activity within the Proposed Project Site is the River Suir. The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by cormorant, including the River Suir. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Cormorant – Operational deterioration in water quality

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during the operational phase of the project could result in a significant detrimental change in water quality in the River Suir, which is located adjacent to the infrastructural footprint. This could result in indirect pollution mediated effects on cormorant, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 100-200 birds. Therefore, based on Percival (2003) taking a medium sensitivity for cormorant and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term to long-term (EPA, 2022) depending on the nature of the aquatic pollution. It is acknowledged that this assessment is highly precautionary and the likelihood of water pollution occurring with the severity and/or duration required to elicit an effect of this magnitude is low.

Cormorant - Operational disturbance/displacement

Small numbers of cormorant (1-3 birds) were regularly recorded within the within the 500 m proposed turbine buffer, with birds most often recorded flying. These commuting flights, as shown in Appendix 7E: Figure 7E.1, along with any records of foraging and loafing birds, were strongly associated with the River Suir. Aside from crossing points, the infrastructural footprint of the Proposed Project avoids the River Suir its tributaries and floodplain, with all the proposed turbines located more than 100 m from the main channel of the river.

As reviewed in Krijgsveld (2014), there are relatively few published studies investigating cormorant behaviour and sensitivity in relation to wind turbines and these are focused on the effects of offshore wind farms. Most of these studies suggest that cormorants are not permanently displaced by the presence of wind turbines, and excluding birds on migration, may even show an attraction to turbines, as the structure provide roosts/loafing sites, foraging opportunities and may facilitate extended foraging ranges in the marine environment (Lindeboom et al, 2011, Furness et al., 2013, Clifford & Mather, 2021a & 2021b). For onshore turbines, while it is understood that the towers will not provide the same perching and foraging functions, as observed for offshore turbines, it is assumed that over time cormorants will habituate to the presence of turbines and behaviour will match pre-construction levels.

Given the separation distance between the turbines and the River Suir, it is considered unlikely that cormorants foraging/swimming in the river will be disturbed or displaced. It is anticipated that there may be some initial avoidance of the Proposed Project area by cormorants commuting up and down the River Suir, e.g. birds may deviate from flight paths following the River Suir and fly around the turbines. This is considered to be more of an inconvenience and the magnitude of effect is judged to be imperceptible (EPA, 2022)/negligible (Percival, 2003). Given the apparent propensity for this species to habituate to turbines, the duration of any displacement effects on commuting cormorants is likely be temporary to short-term (EPA, 2022). Therefore, based on Percival (2003), taking a medium sensitivity for cormorant and magnitude of effect as negligible: < 1%, results in an assessment of not significant for operational displacement effects.

Cormorant - Collision risk

The CRM for cormorant was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 31 years (weighted, 98% default avoidance). As discussed in the previous section, reviews of cormorant behaviour in relation to turbines suggest a level of attraction to the structures as a resource and overall habituation, with the exception of birds on migration. While it is anticipated that habituated birds flying close to turbines will employ high degrees of avoidance behaviour, the relationship between attraction to and avoidance of turbines means there is an inherent risk of colliding with turbines. Therefore, application of default (98%) avoidance within the model is appropriate and the output generated for predicted collision is considered representative of flight activity likely to occur over the operational phase of the project. This level of turbine mediated mortality (1.1 collisions over 35 years) would be totally imperceptible (EPA, 2022)/negligible (Percival, 2003) to background levels and therefore, not significant.

7.4.4.8 Whooper swan – Likely operational phase effects

Whooper swan - Operational habitat loss

Improved grassland, a habitat favoured by foraging whooper swans, will be lost to the Proposed Project. However, this habitat type is abundantly available in the area and given the apparent abandonment of the Proposed Project Site by whooper swans in recent years, no likely significant effects will occur as a result of long-term habitat loss.

Whooper swan - Operational disturbance/displacement

Whooper swans have not been recorded regularly utilising the Proposed Project Site since winter 2016/17. Over the 3 year baseline study, a small flock (3- 5 birds) regularly utilised the area north of the 500 m proposed turbine buffer (Clonamuckoge Beg/Killkillahara) during winter 2020/21; however in subsequent study years only two birds were recorded once foraging within the Proposed Project Site in winter 2021/22. As the Proposed Project Site has not been regularly utilised by whooper swans in recent years, there is no risk of operational disturbance or displacement effects to a regularly occurring population. Furthermore, the irregular occurrence of whooper swans in the wider area and in small numbers indicates that the Proposed Project Site and environs are not important for this species. Therefore, any disturbance or displacement effects on sporadically occurring birds would be inconsequential, and no likely significant effects are anticipated.

Whooper swan - Collision risk

Importantly, there were no regularly occurring flight paths between any roosts and foraging areas identified. No whooper swans flights were recorded through the 500 m proposed turbine buffer and therefore, based on the lack of any flight activity no likely significant effects due to collision risk are anticipated.

7.4.4.9 Shoveler – Likely operational phase effects

It is considered unlikely that shoveler will be adversely affected by the operational phase, due to low usage of the Proposed Project Site and when recorded birds were utilising flooded fields removed from the proposed infrastructure. No flights were recorded through the 500 m proposed turbine buffer and therefore, based on the lack of any flight activity no likely significant effects due to collision risk are anticipated.

7.4.4.10 Curlew – Likely operational phase effects

It is considered unlikely that curlew will be adversely affected by the operational phase, due to low usage of the Proposed Project Site. There are no contemporary breeding records for this species and usage of the Proposed Project Site was only recorded very occasionally by small numbers of birds. No flights were recorded through the 500 m proposed turbine buffer and therefore, based on the lack of any flight activity no likely significant effects due to collision risk are anticipated.

7.4.4.11 Kingfisher – Likely operational phase effects

Kingfisher - Operational habitat loss

The focus of kingfisher activity within the Proposed Project Site is the River Suir. The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by kingfisher, including the River Suir. The extent of potential nesting habitat identified within the 500 m proposed turbine buffer was very limited. Habitat loss associated with infrastructure for drain/stream crossings will not result in any loss of potential nesting habitat. Likewise, the Proposed Project will not result in the loss of foraging habitat along drains/streams. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Kingfisher - Operational deterioration in water quality

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during the operational phase of the project could result in a detrimental change in water quality in the River Suir, located adjacent to the infrastructural footprint; and therefore could result in indirect pollution mediated effects on kingfisher, specifically affecting prey availability, which if prolonged could result in displacement effects.

The magnitude of effect, caused by displacement of 1-2 pairs, would be high: 20-80% (Percival, 2003) given an estimated loss in home range of up to 80%. Therefore, based on Percival (2003) taking a medium sensitivity for kingfisher and a high magnitude effect results in an adverse effect of medium significance on a regionally important population (NRA, 2009), over the short-term to long-term (EPA, 2022) depending on the nature of the aquatic pollution. It is acknowledged that this assessment is highly precautionary and the likelihood of water pollution occurring with the severity and/or duration required to elicit an effect of this magnitude is low.

Kingfisher - Operational disturbance/displacement

Goodship & Furness (2022) assess kingfisher as having a low to medium sensitivity to human disturbance. Pedestrian activity, along with vehicular traffic and human habituation were highlighted as the disturbance factors investigated. The review suggests a breeding and non-breeding season buffer zone of 50-100 m, depending on habituation levels, to protect kingfisher from pedestrian disturbance, especially to protect any nest or roost sites identified.

The behavioural response of kingfishers to operational turbines is unknown, however in this instance all turbines are offset > 100 m from the River Suir. In addition the core areas utilised by kingfisher were determined to be in the southern extent of the 500 m proposed turbine buffer and also to the north of the buffer. No kingfishers were recorded from VP4, located on the Rossestown Bridge and indicated low up and downstream movement along this central section of the river.

Given the separation distance between the proposed turbines and the River Suir, it is considered unlikely that any kingfishers periodically utilising this section of river will be disturbed or displaced and the magnitude of effect is judged to be imperceptible (EPA, 2022)/negligible (Percival, 2003). There are no breeding sites within 500 m of the turbines and potential nesting habitat in very limited. Therefore, based on Percival (2003), taking a medium sensitivity for kingfisher and magnitude of effect as negligible: < 1%, results in an assessment of not significant for operational displacement effects.

Kingfisher - Collision risk

The low flight trajectory typically employed by kingfisher, as well as the associated flight paths largely following waterbodies and in this instance, low recorded usage of the 500 m proposed turbine buffer, means that the risk of kingfishers colliding with turbines is highly unlikely. No likely significant effects due to collision risk are anticipated.

7.4.4.12 Little egret – Likely operational phase effects

Little egret - Operational habitat loss

The focus of little egret activity within the Proposed Project Site is the River Suir, the floodplain and associated ditches, drains and streams. The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by little egret, including the River Suir. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Little egret - Operational deterioration in water quality

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during the operational phase of the project could result in a significant detrimental change in water quality in the River Suir, which is located adjacent to the infrastructural footprint; and could result in indirect pollution mediated effects on little egrets, specifically affecting prey availability which if prolonged could result in displacement effects.

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 50 birds. Therefore, based on Percival (2003) taking a medium/low sensitivity for little egret and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term to long-term (EPA, 2022) depending on the nature of the aquatic pollution. It is acknowledged that this assessment is highly precautionary and the likelihood of water pollution occurring with the severity and/or duration required to elicit an effect of this magnitude is low.

Little egret - Operational disturbance/displacement

There is limited research providing evidence to suggest that wind farms cause any significant issues for little egret. However, this may relate more to distribution of this species being beyond the current distribution of wind farms particularly in countries like Germany, The Netherlands and Belgium where post-construction ornithological monitoring and reporting is notably widespread and transparent, but little egret distribution is relatively restricted. A study conducted in China specifically examining little egret distribution and behaviour in relation to wind turbines (Xu et al., 2021), found that the distance to the wind farm did not have an effect on the abundance of little egrets. The effect of distance to the wind farm on the behaviour of little egrets was also found to be largely

insignificant, except for an effect on stand-and-wait foraging behaviour, which was suggestive that foraging efficiency may be marginally affected.

Assuming similarly low levels of sensitivity to operational turbines for little egret, as documented for grey heron (Hötker et al., 2006 and Rydell et al., 2012), no likely significant effects due to disturbance or displacement caused by operational turbines are anticipated. Therefore, it is considered that disturbance at levels sufficient to induce any discernible displacement effects are unlikely; and conversely, a lack of disturbance may require further assessment in relation to collision risk (see the following section assessing potential impacts due to collision risk).

Little egret - Collision risk

A review by Powlesland (2009) lists herons as one of the species groups most prone to collision fatalities at wind farms in Europe; however, there are very few specific mentions of little egret collision in the literature. As noted in the previous section, this is probably likely to be related, at least in part, to the limited occurrence of little egret in regions where long-term reporting of turbine mediated mortality has been more comprehensive e.g. in Germany (Dürr, 2023).

The CRM for little egret was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 36 years (weighted, 98% default avoidance). Assuming that little egret exhibit low behavioural sensitivity to operational turbines, i.e. displacement effects, the application of default (98%) avoidance within the model is appropriate and the output generated for predicted collision is considered representative of flight activity likely to occur over the operational phase of the project. The level of turbine mediated mortality predicted (1.0 collisions over 35 years) would be totally imperceptible to background levels and no significant population level effects are anticipated. Based on an adult survival rate of 0.712 for little egret (BTO BirdFacts[32]) and taking the estimate of the Irish wintering population as 1,390 birds (Lewis et al., 2019b), additional annual mortality required to have a 1% population effect would have to be higher than 4 collisions per year. Therefore, likely significant effects due to turbine mediated mortality can be objectively ruled out.

7.4.4.13 Grey heron – Likely operational phase effects

Grey heron - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by grey herons that will be lost to the infrastructural footprint of the Proposed Project. The baseline study did identify a heronry, in the woodland to the south of the Proposed Project Site. This was only active over the first breeding season – see Appendix 7I; but was not in use over subsequent seasons (2022 and 2023). Heronries often re-locate to avoid disturbance, such as felling operations.

Woodland, including large standalone trees do offer potential opportunities for heronries, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for grey herons. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Grey heron - Operational deterioration in water quality

In the absence of mitigation, regularly occurring diffuse levels of pollution and/or worst-case scenario pollution incidents during the operational phase of the project could result in a significant detrimental change in water quality in the River Suir, which is located adjacent to the infrastructural footprint; and could result in indirect pollution mediated effects on grey heron, specifically affecting prey availability which if prolonged could result in displacement effects.

[32] BTO BirdFacts – Little egret: https://www.bto.org/understanding-birds/birdfacts/little-egret

The magnitude of population level effect, caused by displacement of 1-2 regularly occurring birds, would be low: 1-5% (Percival, 2003) given a regional population estimated at 50-100 birds. Therefore, based on Percival (2003) taking a low sensitivity[33] for grey heron and a low magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the short-term to long-term (EPA, 2022) depending on the nature of the aquatic pollution. It is acknowledged that this assessment is highly precautionary and the likelihood of water pollution occurring with the severity and/or duration required to elicit an effect of this magnitude is low.

Grey heron - Operational disturbance/displacement

Grey herons are known to habituate to urban settings and in general sensitivity to infrastructure would be considered low. Reviews by Hötker et al. (2006) and Rydell et al. (2012) note that grey heron are frequently observed close to or within wind farms. For the studies reviewed (n = 6), which covered the non-breeding season, they found that minimum distances to turbines were relatively low for this species (median distance: 30 m, mean distance: 67 m, standard deviation 97 m). Given the apparent low sensitivity of grey heron to operational turbines, it is considered that disturbance at levels sufficient to induce any discernible displacement effects is unlikely; and conversely, a lack of disturbance may require further assessment in relation to collision risk (see the following section assessing potential impacts due to collision risk). No evidence specifically examining behavioural avoidance of turbines by grey herons could be found in the literature.

Overall, no likely significant effects due to disturbance or displacement caused by operational turbines are anticipated for grey heron.

Grey heron - Collision risk

A review by Powlesland (2009) lists herons as one of the species groups most prone to collision fatalities at wind farms in Europe. A study investigating collision risk of power lines in Ireland (RSP, 2016), which were in close proximity to wetlands, found grey heron to be one of the most frequently recorded species as probable victims of collisions with powerlines. Although apparently susceptible to collisions with turbines, with collisions reported relatively frequently (e.g. Dürr, 2023), this is likely to be partly a function of grey heron being a widespread and common species, and therefore will be reported at higher frequency than other less commonly occurring species.

The CRM for grey heron was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 27 years (weighted, 98% default avoidance). Given that grey herons appear to exhibit low behavioural sensitivity to operational turbines, i.e. limited displacement effects, the application of default (98%) avoidance within the model is appropriate and the output generated for predicted collision is considered representative of flight activity likely to occur over the operational phase of the project. The level of turbine mediated mortality predicted (1.3 collisions over 35 years) would be totally imperceptible to background levels and no significant population level effects are anticipated. Based on an adult survival rate of 0.732 for grey heron (BTO BirdFacts[34]) and taking an acknowledged underestimate of the Irish wintering population of 2,610 birds (Lewis et al., 2019b), additional annual mortality required to have a 1% population effect would, conservatively, have to be higher than 7 collisions per year. Therefore, likely significant effects due to turbine mediated mortality can be objectivity ruled out

[33] Note: Technically, based on Percival (2003), grey heron, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as a wintering waterbird occurring at low densities that may be susceptible to disturbance at the local population level.
[34] BTO BirdFacts – Grey heron: https://www.bto.org/understanding-birds/birdfacts/grey-heron

7.4.4.14 Mute swan – Likely operational phase effects

Mute swan - Operational habitat loss

The focus of mute swan activity within the Proposed Project Site is the River Suir and the floodplain, along with associated ditches, drains and streams under flood conditions. The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by mute swan, including the River Suir. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Mute swan - Operational disturbance/displacement

Mute swans are considered relatively tolerant of human disturbance and built infrastructure and for instance, regularly occur in waterbodies with parks in towns and cities. However, mute swan responses to the disturbance/displacement effects of operational turbines are not well documented, probably largely due to this species often occurring at low densities in the vicinity of wind farms and therefore, not generating much information. Also mute swans are very much a secondary target species to whooper swans and as such may be perceived as being less affected by wind farm development. This may be the case, as mute swans exhibit more sedentary behaviour over the winter than whooper swans; and although, they do congregate on waterbodies, they tend to remain in situ and are less likely to undertake regular commutes between roosts and foraging areas.

The focus of mute swan activity within the Proposed Project Site, including foraging and nesting was along the River Suir. While the location of the nest is likely to move and the area not be occupied annually, over the baseline period the closest turbines were T07, c. 200 m to the east, and T08 c. 400 m to the west. The fact that mute swans were regularly observed in or adjacent to the river combined with the low frequency of flights suggests that birds were largely sedentary, probably moving through the area more by swimming than flying. Flood events are likely to attract more swans into the area, as observed over November 2022.

Even with all the proposed turbines offset > 100 m from the River Suir, it is possible that there may be some initial displacement effects once the turbines are operational and a pair holding a territory may nest elsewhere until they habituate to the Proposed Project. As noted, information on the displacement effects of turbines for mute swans is deficient. Based on overall low sensitivity to disturbance effects and evidence of habituation to human activity/infrastructure, applying a precautionary approach to the assessment, it is anticipated that there is potential for some slight (EPA, 2022) disturbance effects on wintering and breeding birds that could result in temporary to short-term (EPA, 2022) displacement effects on a population of local (higher value) importance (NRA, 2009). There will be no significant (> 1%) population level effects at a national or county (regional) scale and effects will be expressed on the local population. Based on Percival (2003), the magnitude of effect is assessed as negligible: <1% and therefore, taking a medium sensitivity for mute swan results in an assessment of not significant for operational displacement effects.

Mute swan - Collision risk

Mute swan, together with other species of swan are well represented on the list of birds that have been reported as victims of turbine collisions (e.g. Crockford, 1992, Kingsley & Whittam, 2005, Dürr, 2023), and are also notably susceptible to colliding with static overhead power lines (e.g. Rose & Baillie, 1989, Perrins & Sears, 1991, Mathiasson, 1993), apparently more so than with turbines (Whitfield, 2010). Based on evidence presented in Whitfield & Urquhart (2015), the turbine avoidance for swan species was increased from a highly precautionary 95% (SNH, 2010) to 99.5% (SNH, 2018a), which remains precautionary and avoidance of 99.7 to 99.8% for swans was considered more representative by the authors of the advice note (Whitfield & Urquhart, 2015).

As detailed in the species account for mute swan (Section 7.3.4.2), only one flight (9 birds) was recorded within the CRZ, equating to a total of 1,080 aggregated flight seconds. No regular flight paths between foraging and roosting locations were identified. Flight activity mostly involved low level flights, with birds heading up or down stream along the river, as shown in flight line maps in Appendix 7E. As only a single flight occurred within the CRZ,

no CRM was run for this species and no significant (> 1%) population level effects due to collision risk is anticipated for mute swan.

Based on low level flight activity recorded within the Proposed Project Site for mute swans and the higher avoidance rates (0.995) assumed for swans, no likely significant effects due to collision risk are anticipated.

7.4.4.15 Wigeon – Likely operational phase effects

It is considered unlikely that wigeon will be adversely affected by the operational phase, due to low usage of the Proposed Project Site and when recorded birds were typically utilising flooded fields removed from the proposed infrastructure. One flight record was recorded through the 500 m proposed turbine buffer and therefore, based on low levels of flight activity no likely significant effects due to collision risk are anticipated.

7.4.4.16 Mallard – Likely operational phase effects

Mallard - Operational habitat loss

The focus of mallard activity within the Proposed Project Site is the River Suir and the floodplain, along with associated ditches, drains and streams. The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by mallard, including the River Suir. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Mallard - Operational disturbance/displacement

A review by Hötker (2017) classes duck species as one of the species groups most affected by displacement due to operational turbines and suggests that they might abandon suitable habitat within or close to a wind farm or use it less frequently than they would in the absence of the wind farm. A study in the USA (Loesch et al., 2013) investigating breeding densities of dabbling duck, including mallard, at onshore wind farm sites vs control sites, found that wetlands associated with wind farm sites, although not totally abandoned, were utilised at reduced densities by breeding dabbling ducks, averaging out at about a 20% decrease, with a maximum effect of 56% reported. This is supported by three post-construction monitoring studies in the UK (Percival et al., 2009a, 2011b, 2015a) where median distances from mallard nest locations to the closest turbine were analysed and showed an increase in median values post-construction, suggestive of the breeding population shifting further away from proposed turbines. This result was not ubiquitous for all the post-construction breeding seasons monitored, as shown by the following data, and there was a high degree of variation in nesting locations between years, with the closest distance not changing significantly and mallards attempted to breed within c. 20 m of a turbine.

Case study 1

Source: Percival et al. (2009a)	Turbine height: 100 m	No.: 12 turbines	Operational: early 2007
Closest distance: pre-construction: c. 80 m	post-construction 2007: c. 80 m, 2008: c. 50 m		
• 27% increase	230 m (n = 8 prs) in 2003	293 m (n = 9 prs) in Year 1: 2007 (1st br. season)	
• 47% increase		337 m (n = 17 prs) in Year 2: 2008 (2nd br. season)	

Case study 2

Source: Percival et al. (2015a)	Turbine height: 100 m	No.: 6 turbines	Operational: spring 2006
Closest distance: pre-construction: c. 20 m	post-construction: 2007: c. 20 m, 2008: c. 60 m, 2009: c. 60 m		
• 14% decrease	201 m (n = 11 prs) in 2001	173 m (n = 8 prs) in Year 1: 2007 (2nd br. season)	
• 84% increase		370 m (n = 10 prs) in Year 2: 2008 (3rd br. season)	
• 21% increase		243 m (n = 5 prs) in Year 3: 2009 (4th br. season)	

Case study 3

Source: Percival et al. (2011b)	Turbine height: 100 m	No.: 9 turbines	Operational: October 2007
Closest distance: preconstruction: c. 100 m	post-construction 2009 c. 125 m, 2010: c. 125 m, 2011: c.150 m		
• 22.5% increase	289 m (n = 13 prs) in 2003	354 m (n = 16 prs) in Year 1: 2009 (2nd br. season)	
• 0.3% increase		290 m (n = 14 prs) in Year 2: 2010 (3rd br. season)	

- 3.0% increase 298 m (n = 17 prs) in Year 3: 2011 (4th br. season)

In terms of effects on wintering mallard, a post-construction monitoring study in The Netherlands (Winkelman, 1992) found evidence of decreased occurrence of mallard out to 300 m from the wind farm. A Chinese study (Zhao et al., 2020) found that species of wintering duck, including mallard, tended to occupy areas further away from turbines and results were considered indicative of turbine avoidance. However, displacement effects were not fully tested and there were additional factors affecting habitat selection, including disturbance from other forms of human activities and overall habitat availability.

As reviewed in Goodship & Furness (2022), mallard are considered a species that readily habituate to human activity, especially if the source of disturbance is predictable, and the review notes that Platteeuw & Henkins (1997) recorded mallard foraging, loafing and possibly breeding within 50 m of frequently used navigation routes and close to harbours. There is evidence that this level of habituation translates to turbines, as recorded by Percival et al. (2015a) where mallard nested within c. 20 m of a turbine in the second breeding season after construction and within 60 m in the two subsequent seasons. In summary, current research indicates that there is a level of displacement to breeding and wintering mallard caused by operational turbines; however, information characterising the likely magnitude of displacement effects is deficient.

Based on overall low sensitivity to disturbance effects and evidence of habituation to predictable human activity/associated infrastructure, applying a precautionary approach to the assessment, it is anticipated that there is potential for some slight (EPA, 2022) disturbance effects on wintering and breeding birds that could result in temporary to short-term (EPA, 2022) displacement effects on a population of local (higher value) importance (NRA, 2009). There will be no significant (> 1%) population level effects at a national or county (regional) scale and effects will be expressed on the local population. Based on Percival (2003), the magnitude of effect is assessed as negligible: <1% and therefore, taking a medium sensitivity for mallard results in an assessment of not significant for operational displacement effects.

As an additional consideration, during the baseline study, it was noted that the Proposed Project Site was hunted during the open season for duck (September to January, inclusive), which already imposes a periodic displacement effect on the wintering population over this period and obviously contributes to mortality.

Mallard - Collision risk

Mallard, probably as result of being a widespread, common species inhabiting a range of habitats and possibly exhibiting lower sensitivity to the displacement effects of wind farms, are one of the most regularly reported waterbird species for turbine collisions (Musters et al., 1996, Erickson et al., 2001, Grünkorn et al., 2016, Dürr, 2023).

For the Proposed Project Site, although 3,478 aggregate flight seconds were recorded for mallard within the 500 m proposed turbine buffer, only two flights were recorded at heights above 25 m, equating to 431 aggregate flight seconds within the CRZ. Therefore, no CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for mallard is assessed as highly unlikely to result in any significant (> 1%) population level effects. Based on Percival (2003) the magnitude of effect is assessed as negligible: < 1% and therefore, taking a medium sensitivity for mallard results in an assessment of not significant for collision risk.

7.4.4.17 Teal – Likely operational phase effects

Teal - Operational habitat loss

The focus of teal activity within the Proposed Project Site is the River Suir, as well as the small pond in the southern woodland. The footprint of the site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by teal, including the River Suir and the pond. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Teal - Operational disturbance/displacement

Small numbers of teal (1-4 birds) were regularly recorded in winter utilising the River Suir, within the 500 m proposed turbine buffer. Occasionally, larger numbers were recorded including 120 birds associated with flooding in the area. Although no breeding sites were located, there is some suitable nesting cover.

Bregnballe et al. (2009) investigating responses of waterbirds to disturbance from pedestrians found that teal had a marginally lower mean escape distance than mallard, which is supported by results from Pease et al. (2005), suggesting that teal were the more sensitive species. Lin (1995) found that wintering blue-winged teal[35] had a similar response as mallard to disturbance from human activities including walkers, cyclists and vehicles, and demonstrated a tendency for habituation, especially toward vehicles.

It is anticipated that there will be some level of displacement effect to teal caused by the turbines once operational, however over time birds will habituate to the turbines and overall any displacement effects will be short-term (EPA, 2022). In addition, as only very small numbers of teal regularly occur within the Proposed Project Site (1-4 birds), the magnitude of any effects will be slight (EPA, 2022) and there will be no significant (> 1%) population level effects at a national or county (regional) scale. Any effects will be expressed on the wintering local population. Based on Percival (2003), the magnitude of effect is assessed as negligible: <1% and therefore, taking a medium sensitivity for teal results in an assessment of not significant for operational displacement effects.

As an additional consideration, during the baseline study, it was noted that the Proposed Project Site was hunted during the open season for duck (September to January, inclusive), which already imposes a periodic displacement effect on the wintering population over this period and obviously contributes to mortality.

Teal - Collision risk

Relatively low numbers of teal are reported as colliding with turbines in Germany (Dürr, 2023), especially in the context of this species being highly gregarious out of the breeding season, with large numbers moving on passage, as well as wintering birds congregating in a range of wetland habitats. Based on figures collated for Germany in Dürr (2023), mallard have registered substantially more turbine mediate fatalities than other commonly occurring duck species, with 214 collisions reported for mallard and only 6 reported for teal, followed by wigeon (5), gadwall (3), tufted duck (3) and shoveller (1). This data, although only presenting the raw (uncorrected) counts of reported collisions, is suggestive of higher levels of turbine avoidance and/or displacement for teal, when compared to a similar species like mallard. Alternatively, this could also be a function of core teal populations being distributed in areas away from where turbines are being more routinely monitored for fatalities. Two post-construction monitoring studies reviewed appeared to mirror the results of German fatality records, including:

- Muster et al. (1996) - over one year of intensive monitoring: mallard (4) and teal (1)
- Percival et al. (2018a, 2018b) - over three years of seasonal monitoring: mallard (1) and teal (0)

Results for a North American study (Gue et al., 2013), testing the effects of wind energy on breeding female mallard (n = 77) and blue-winged teal (n = 88) using data from radio tracked birds nesting site at wind farms and control sites, suggested that wind turbines had limited or no direct effect on female survival, with only 1 mallard collision and no blue-winged teal collisions recorded, the majority of fatalities (78%) were attributed to predation. Desholm & Kahlert (2005) using radar to track bird movements on migration in relation to offshore turbines found less than 1% of the ducks and geese migrated close enough to the turbines to be at any risk of collision, suggesting a high degree of avoidance even during flights at night. In terms of flight behaviour teal are fast (up to 100 km/h)

[35] Blue-winged teal *Spatula discors*, in terms of wintering habits are a comparable species to the Eurasian (green-winged) or common teal *Anas crecca* found in Ireland. Based on analysis of mitochondrial DNA (Gonzalez et al., 2009), blue-winged teal once classified within the monotypic *Anas* genus along with green-winged teals and mallard, were re-assigned to the *Spatula* genus, which includes shovelers, other species of re-classified teals and garganey. American green-winged teal *Anas carolinensis* and Eurasian/common (green-winged) teal *Anas crecca*, were once considered subspecies, and have been split into separate species. Small numbers of American teal are recorded annually in Ireland and they are referred to as green-winged teal, which differentiates these vagrant from regularly occurring teal.

and notably agile, which combined with a smaller body size may allow this species to avoid collisions more readily than large duck like mallard.

For the Proposed Project Site, no teal flights were recorded within the 500 m proposed turbine buffer during VP watches. Therefore, no CRM was run for this species and based on observed usage of the 500 m proposed turbine buffer, collision risk for teal is assessed as highly unlikely to result in any significant (> 1%) population level effects. Based on Percival (2003) the magnitude of effect is assessed as negligible: < 1% and therefore, taking a medium sensitivity for teal results in an assessment of not significant for collision risk.

7.4.4.18 Jack snipe – Likely operational phase effects

Jack snipe - Operational habitat loss

The footprint for the proposed site infrastructure has been designed to avoid any substantial long-term loss of wetland habitats likely to be utilised by wintering jack snipe. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Jack snipe - Operational disturbance/displacement

The proposed turbines and associated infrastructure avoid directly impacting on wetland habitats and habitat availability for jack snipe will be comparable to the baseline. The proposed turbines are located adjacent to areas of wetlands and have the potential for disturbance/displacement effects on wintering birds. For jack snipe the area of marshy habitat southeast of T02 was noted as particularly suitable.

No information could be sourced specifically detailing the effects of wind farms on jack snipe[36]. For the purposes of this assessment, it is assumed that the small numbers of jack snipe recorded wintering or on passage will exhibit similar behaviour as snipe to any potential disturbance caused by the Proposed Project once operational. Therefore, it is anticipated that there will be some localised displacement effects on birds utilising suitable habitats adjacent to proposed turbine locations. Reduced utilisation of suitable foraging/roosting habitats around turbines is unlikely to extend > 80-100 m from the turbine base. As wintering/passage birds are mobile and not restricted to specific locations they can move more freely to exploit alternative resources beyond the zone of potential displacement.

Given the favourable (green listed) conservation status of jack snipe (Gilbert et al., 2021) and small size of the wintering population utilising the Proposed Project Site the magnitude of any displacement effects to wintering/passage birds will be very slight to imperceptible (EPA, 2022). There will be no significant (> 1%) population level effects on jack snipe and based on Percival (2003) the magnitude of effect is assessed as negligible: < 1% and therefore not significant.

Jack snipe - Collision risk

A small number of jack snipe turbine collisions have been reported (Dürr, 2023). As discussed for snipe, avoidance of turbines and displacement effects are also likely to result in lower collision risk for jack snipe. Therefore, in view of the favourable (green listed) conservation status of jack snipe (Gilbert et al., 2021) and the small size of the wintering population utilising the Proposed Project Site, the magnitude of effect for collision risk to wintering/passage birds is assessed as imperceptible (EPA, 2022). There will be no significant (> 1%) population level effects on jack snipe and based on Percival (2003) the magnitude of effect is assessed as negligible: < 1% and therefore not significant.

[36] Note: Technically, based on Percival (2003), jack snipe, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as a species of wintering waterbird probably regularly utilising the Proposed Project Site, although occurring at low densities may be susceptible to disturbance effects at the local population level.

7.4.4.19 Woodcock – Likely operational phase effects

Woodcock - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by woodcock that will be lost to the infrastructural footprint of the Proposed Project. Only wintering woodcock have been recorded utilising the Proposed Project Site, which utilise the woodland and scrub habitats for day roosting and will forage in adjacent grassland habitat at night. No breeding territories were identified.

The amount of grassland habitats potentially utilised by nocturnally foraging woodcock that will be lost to the infrastructure footprint of the Proposed Project is inconsequential, relative to the area of grassland that will remain post-construction. Likewise, areas of woodland and scrub potentially utilised by woodcock will be lost to the Proposed Project, however the overall extent of habitat that will be removed has been kept to a minimum and only relatively small areas across the site will be subject to clearance. Therefore, it is considered that an adequate area of suitable habitat will remain over the operational phase of the project to provide ample cover and foraging opportunities to support the baseline wintering woodcock population. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Woodcock - Operational disturbance/displacement

There is evidence of operational turbines impacting on breeding woodcock and resulting in reduced display activity in roding males. As discussed in Dorka et al. (2014), Schmal (2015) and Straub et al. (2015), an 88% decline in territorial males was detected between pre-construction surveys and Year 1/Year 2 post-construction surveys (10 males/100 ha to 1.2 males/100 ha). Based on the findings from this study LAG VSW (2015) recommends a turbine standoff distance of 500 m (minimum) to buffer the flight paths of roding males against any displacement effects. An Irish study (Gittings, 2019) looking at roding activity in relation to turbines found that activity within 250 m of the turbines was significantly less than predicted, indicating a level of displacement; while activity recorded between 250-500 m from the turbines was higher than predicted and there was no evidence of displacement.

No breeding population was identified at the Proposed Project Site. There are no published studies investigating the effects of operational wind farms on the wintering population, which in Ireland is not assessed as having unfavourable conservation status (Gilbert et al., 2021). Surveyors from Woodrow deploying night recording cameras have (incidentally of the deployment) captured footage of woodcock flying into improved grassland to forage within 150 m of turbines. On another site a woodcock fatality, suspected of flying into a turbine was recovered during searches beneath turbines (only scavenged remains found). These examples illustrate as for many species, that while the effect of turbine displacement may be minimal, activity adjacent to turbines heightens the risk of collisions. Woodcock are quarry species in Ireland and can be hunted over the open season (November to January inclusive) and as such wintering birds experience intensive levels of disturbance without any apparent long-term displacement effects, e.g. areas of roosting cover are not abandoned after being hunted and annually birds return to the same wintering locations. Therefore, for the purposes of this assessment wintering woodcock are classed as having relatively high thresholds to disturbance and are considered unlikely to exhibit any substantial displacement effects due to operational turbines.

The operational footprint of the proposed wind farm has the potential to result in a localised displacement of wintering woodcock to adjacent areas with similar cover. However, post-construction availability of woodland/scrub cover is not considered to be a major factor likely to limit the occurrence of this species at this location, as ample cover will remain throughout the operational phase of the project. Through project design (embedded mitigation) the best examples of woodland habitat have been avoided. The magnitude of population level effect, caused by slight (EPA, 2022) displacement effects on wintering birds, would be negligible: < 1%

(Percival, 2003). Therefore, based on Percival (2003), taking a precautionary low sensitivity[37] for wintering woodcock and a negligible magnitude of effect results in an assessment of not significant

Woodcock - Collision risk

In relation to collision risk for breeding woodcock, Derouaux et al. (2012) note that roding behaviour was thought to contribute to surprisingly high levels of woodcock mortality due to collision with powerlines in Belgium. As detailed in Loss et al. (2020), American woodcocks on migration are susceptible to collision with manmade infrastructure, with risk appearing to increase in relation to climatic conditions such as snowstorms and low cloud. Wind farm avian mortality studies in Flanders, as reported in Everaert (2014), list two woodcock as victims of collision with turbines; however, there are no details on seasonality provided, i.e. whether birds were on migration, wintering or breeding in the area. Collision data compiled in Germany (Dürr, 2023) reports more woodcock collisions (10 birds) than snipe (2 birds).

While acknowledging that the data compiled by Dürr (2023) is not representative of systematic turbine collision studies and notwithstanding the inherent difficulties of finding the carcasses of small cryptic species like snipe (Humphreys et al., 2015, updated 2017d); snipe being smaller, faster and more agile in flight than woodcock[38] do generate lower averaged collision risk probability using the Band model. Therefore snipe would be predicted to avoid collisions more readily by virtue of passes through the risk volume faster. For Turbine Type B[39], applying the inputs specified in the footnotes, the Band model generates averaged collision risk probability of 4.67% for woodcock and 4.25% for snipe. Due to the nocturnal flight activity of woodcock, no flight time data was collected to populate the CRM.

The number of woodcock wintering in Ireland is not known (NPWS, 2019) and numbers may vary depending on climatic conditions across Europe. There is a substantial influx of birds from continental Europe over the winter and it is estimated that there could be a five-fold increase in the population (BTO BirdFacts). It is anticipated that turbine mediated for woodcock will be relatively low for the Proposed Project Site and there will be no significant (> 1%) population level effects at a national or county (regional) scale. Any effects are likely to be expressed on the local wintering population, which is not assessed as having an unfavourable conservation status (Gilbert et al., 2021). As discussed for collision risk to snipe in Section 7.4.4.4, taking a precautionary approach in the absence of scientific data or research, collision risk to the nocturnal flight activity for woodcock has the potential for low: 1-5% population level effect (Percival, 2003) on the local wintering population. The magnitude of effect arising from collision risk is tempered by the favourable conservation status of wintering woodcock and the fact that this species is actively hunted in the area, over the open season (November to January inclusive). On balance it is considered that turbine mediated mortality would not have any significant (> 1%) additive population level effect on wintering woodcock and based on Percival (2003) the magnitude of effect is assessed as negligible: < 1% and not significant.

7.4.4.20 Kestrel – Likely operational phase effects

Kestrel - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by kestrel that will be lost to the infrastructural footprint of the Proposed Project. The baseline study did not identify any active breeding sites within the Proposed Project Site. Woodland and treelines do offer potential nesting opportunities for this species, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed

[37] Note: Technically, based on Percival (2003), wintering woodcock would fall below the level requiring assessment; however low sensitivity was assigned in the assessment on a precautionary basis as breeding population has an unfavourable conservation status (Gilbert et al., 2021), although wintering population is not listed as being of conservation concern.

[38] The following biometrics and flight speeds were applied in the Band collision risk model for woodcock and snipe:

- Woodcock flight speed: 12.5 m/s body length: 0.34 m wingspan: 0.58 m
- Snipe flight speed: 17.1 m/s body length: 0.26 m wingspan: 0.46 m

[39] The following operational parameters were applied: Rotational period: 6.85 second and pitch: 6°

Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for kestrels. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Kestrel - Operational disturbance/displacement

Foraging and (probably) breeding kestrel do not appear to suffer displacement effects from operational turbines, which combined with flight behaviour, may explain the elevated levels of collisions associated with this species – see following section on collision risk. Often habitat conditions within post-construction wind farm sites, e.g. felled areas, tracks and habitat management areas, creates good foraging habitat for kestrels and may actively attract birds into the site, increasing the potential for collisions to occur.

Generally, kestrels would be considered a species that becomes habituated to human activity; for instance, birds regularly nest in active quarries. At one wind farm site, surveyors from APEM Group Woodrow located a pair of kestrels using a hooded crow nest in a treeline of Sitka spruce, which was located c. 95 m from a turbine tower. A review of post-construction monitoring studies found that the majority of sites supporting breeding kestrels prior to construction continued to support pairs within 300 m of turbines (Percival et al., 2009a, 2009b, 2009c, 2011a, 2011b, 2016b), with pairs noted as moving beyond 300 m at two of the sites reviewed (Percival et al., 2015a 2016a), and although this could be indicative of displacement, kestrels are a species that regularly re-locates to different sites between years.

Based on kestrels apparently exhibiting a high level of tolerance to operational turbines, any disturbance and/or displacement effects are unlikely, and collision risk is the main consideration for this species.

Kestrel - Collision risk

Tolerance of turbines combined with flight behaviour means kestrels are a species emerging as notably susceptible to collision with turbines and this is acknowledged within the collision risk model, which is run with a lowered avoidance rate for kestrel (95% avoidance rate). The CRM for kestrel was run allowing for year-round utilisation of the 500 m proposed turbine buffer and the outputs from this model generated predicted collision risk of 1 collision every 4.8 years (weighted, 95% avoidance), equivalent to 7 collisions over 35 years.

As detailed in Section 7.3.5.4, the potential magnitude of effect on the local kestrel population due to predicted collision risk was tested on a local population estimate of 6 adult birds and 4 juvenile subadult birds, using the measured rate of 0.21 collisions per annum and applying an annual survival rate of 0.69 to the adult population and 0.32 to the subadult population (BTO BirdFacts[40]). This generates an 11% and 8% increase in mortality above background levels, for the adult and subadults components of the population respectively. Based on Percival (2003), taking a medium sensitivity for kestrel and a moderate: 6-20% magnitude effect, results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the long-term (EPA, 2022).

7.4.4.21 Barn owl – Likely operational phase effects

Barn owl - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by barn owl that will be lost to the infrastructural footprint of the Proposed Project. It is considered that the overall structure and connectivity through the habitats occurring on the site will not be altered significantly by the Proposed Project.

The baseline study did not identify any active breeding sites within the Proposed Project Site. Veteran trees within woodland do offer potential nesting opportunities for this species, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for barn owl.

No likely significant effects are anticipated to occur as a result of long-term habitat loss.

[40] BTO BirdFacts – Kestrel: https://www.bto.org/understanding-birds/birdfacts/kestrel

Barn owl - Operational disturbance/displacement

As discussed in relation to construction phase impacts, barn owls are generally considered relatively tolerant of human activities. Barn owls have been recorded breeding successfully within 750 m of a wind farm comprising 16 turbines and bred successfully over three years within 35 m of a smaller domestic turbine (Barn Owl Trust, 2015). In addition, barn owls are reported as successfully breeding at an operational large wind farm in Scotland (Crystal Rig)[41] and at a nine-turbine site under construction, also in Scotland (Twentyshilling)[42]. At both these wind farms nest boxes have been provided to maintain barn owl breeding sites. A post-construction monitoring study (Percival et al. 2009a) reported a barn owl breeding site within 100 m of turbines and the nest site had been occupied five times previously during pre-construction surveys.

No likely significant effects are anticipated to occur as a result of operational disturbance and/or displacement.

Barn owl - Collision risk

Owl species have been identified as being at risk of collision as a result of wind farm developments (Langston & Pullan 2003), due to their size and nocturnal/crepuscular hunting behaviour and barn owl collisions with turbines are reported (see Dürr 2023). There are also several unpublished accounts of barn owl collisions; however, these appear to be predominately associated with small domestic turbines and the lattice tower structure employed widely in the erection of wind turbines in North America, where barn owls are migratory. Based on the Barn Owl Trust (2015) in the UK (applicable to Ireland), where barn owls are more or less sedentary, it is generally considered that low level flight behaviour (typically < 3-4 m) limits collision risk with larger turbines. In addition, lattice towers are not employed in Ireland. Furthermore, the Barn Owl Trust (2015) goes on to state:

"*Based on available evidence, the Barn Owl Trust takes the view that, overall, the level of threat posed to Barn Owls by wind turbines in Britain is relatively very low*."

Therefore, likely significant (> 1%) effects due to turbine mediated mortality can be objectively ruled out.

7.4.4.22 Peregrine – Likely operational phase effects

Peregrine - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by peregrine falcon that will be lost to the infrastructural footprint of the Proposed Project. In particular no potential nesting locations will be lost and overall the structure and connectivity through the habitats occurring on the site will not be altered significantly by the Proposed Project.

Peregrine - Operational disturbance/displacement

A pair of peregrines nest within 600 m of the closest proposed turbine location (T10). The Proposed Project is likely to be within the core foraging area for this pair; although flight activity within the 500 m proposed turbine buffer recorded from VP watches was notably low, suggesting that birds may forage further afield. As noted by SNH (2016) peregrines can have extensive home ranges with a maximum breeding season range of up to 18 km reported. While there is no species specific avoidance rate given for peregrines and a default 98% avoidance is applied in the CRM, it is anticipated that peregrines flying through the proposed turbine array will exhibit a level of avoidance directly around turbines and this will result in a very slight displacement effect, which based on Percival (2003) is assessed as negligible: < 1% and therefore not significant. This is supported by a data collected from a study on offshore turbines (Robinson Willmott et al., 2023)[43]. This study used a range of camera and audio recording technology to track bird and bat movement in close proximity to offshore turbines. The results captured

41 See press release at: http://www.pes.eu.com/wind/ornithological-plan-leads-to-barn-owl-success/
42 See press release at: Breeding Barn Owl Pair Get New Spring Home (dgwgo.com)
43 Proceedings from WindEurope Annual Event, Copenhagen 25-27 April 2023, accessed via: https://iopscience.iop.org/article/10.1088/1742-6596/2507/1/012006/pdf

peregrine perched and resting on turbine towers, plucking prey in one instance and patrolling the turbines, which was mostly undertaken when the blades were stationary during periods of low wind.

Under certain circumstances breeding peregrines are known to be highly tolerant of human activities occurring in the environs adjacent to breeding sites, including for example blasting, rock excavation and processing in quarries (Moore et al., 1997). In terms of tolerance to infrastructure, peregrines in the UK are increasingly being recorded nesting on the transmission towers for electrical powerlines and there is a record of peregrines nesting in a decommissioned (still standing but not rotating) turbine near Richborough Power Station in Kent. In 2018 at an operational turbine in North Rhine Westfalia, Germany peregrines are reported as occupying a nest box fitted to the turbine tower and bred successfully with no fatalities reported[44]; however no further updates on this pair were found.

In Ireland, pairs of peregrine are often associated with power stations and nest boxes are often set up to provide nesting opportunities on these large industrial structures. Two recently constructed wind farms in Co. Offaly, Clooncreen Wind Farm and Cushaling Wind Farm, have turbines within c. 0.9 km and c. 1.25 km of the same peregrine site, respectively. Pairs of breeding peregrines monitored by APEM Group Woodrow surveyors have been recorded breeding successfully within c. 1.4 km of the closest turbine on Slieve Rushen (Co. Cavan/Fermanagh) and within c. 450 m of the closest turbine at Killala Community Wind Farm (Co. Mayo). Taking into consideration the strong habituation tendencies of peregrines, it is anticipated that once operational the proposed turbines will not result in the displacement of the resident pair. Equally, given the separation distance of c. 600 m to the closest turbine, no disturbance effects that might cause birds to flush and be less attentive of eggs or young chicks are anticipated. Therefore, based on Percival (2003), disturbance and/or displacement effects on the resident pair of peregrine falcons, is assessed as negligible: < 1% and therefore not significant.

Peregrine - Collision risk

A review by Humphreys et al. (2015, updated 2017b) examining the number of reported collisions across European wind farms suggested that based on the relatively low numbers of peregrine fatalities reported, this species appears to exhibit a low collision risk, i.e. a high level of avoidance. For example, based on reported fatalities from German wind farms (Dürr, 2023) substantially more kestrel collisions (155) have been reported than for peregrine (30). Humphreys et al. (2015, updated 2017b) caveats this indicative finding with an acknowledgement that there is a lack of systematic monitoring and formal reporting of turbine mediated mortality, and it is important to stress that often the collisions reported have not been adjusted for searcher efficiency and carcass persistence (e.g. Smallwood, 2007, Urquhart et al., 2015). In addition, direct comparison of collisions reported for different species should be examined in the context of species abundance and occurrence in relation to the distribution of wind farms where turbine searches are occurring.

As detailed in the species account for peregrine in Section 7.3.5.6, for the Proposed Project low levels of flight activity in the 500 m proposed turbine buffer resulted in low predicted collision risk. The CRM outputs generated predicted collision risk of 1 collision every 44 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be virtually imperceptible to background levels and no significant population level effects would be anticipated to the national population. Predicted collision risk does have the potential for a low magnitude of effect (1-5%) on the local breeding population. However, in the context of a stable or expanding national peregrine population any additional turbine mortality will have an imperceptible impact (< 1%) on the regional peregrine population, which will recruit into the local area and replace any birds occasionally lost to turbine mediated mortality. While it is anticipated that adult birds will exhibit avoidance, the proximity of the nest to the proposed turbines introduces a level of uncertainty for collision risk to recently fledged birds, especially if dispersal flight behaviour changes from that observed over the baseline.

[44] As reported in WindPower Monthly 31 July 2018, accessed via: https://www.windpowermonthly.com/article/1489017/safe-havens-protected-birds

Taking a precautionary approach to account for a level of uncertainty around collision risk to recently fledged birds, the magnitude of effect is assessed as a low: 1-5% population level effect on the local peregrine population. Therefore based on Percival (2003) taking a medium sensitivity for peregrine and a low: 1-5% magnitude effect results in adverse effect of low significance on a regional important population (NRA, 2009), over the long-term (EPA, 2022).

Post-construction monitoring around fledging time is advised to assess dispersal behaviour and ensure that young peregrines fledge and disperse safely.

7.4.4.23 Sparrowhawk – Likely operational phase effects

Sparrowhawk - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by sparrowhawk that will be lost to the infrastructural footprint of the Proposed Project. Woodland and treelines do offer potential nesting opportunities for this species, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for sparrowhawk. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Sparrowhawk - Operational disturbance/displacement

Based on the post-construction monitoring reports (see Percival et al.) there is some evidence of displacement effects on breeding sparrowhawk. However, the results presented were not conclusive, as the number of pairs recorded in the pre-construction baselines was typically low, usually one pair. There is limited data on the behavioural response of sparrowhawk to turbines. Applying a precautionary approach, it is considered that there will be some low displacement effects to breeding pairs located within c. 300 m of turbines over the short-term (EPA (2022) and with time sparrowhawk will become habituated to turbines. Therefore, no significant (> 1%) population level displacement effects are not predicted beyond the local scale and effects will be imperceptible (EPA, 2022).

Sparrowhawk - Collision risk

On balance sparrowhawks tend to fly relatively low (below rotor swept height < 20 m), especially when hunting, which inherently reduces the likelihood of collision for this species. However, display flights and when commuting over longer distances does result in flight time within the collision risk zone. Sparrowhawk fatalities due to collisions with turbines do occur, and as would be expected based on flight behaviour the numbers of collision reported for sparrowhawk (44) in Dürr (2023) are much lower than collisions reported for other commonly occurring raptors, like buzzard (772) and kestrel (155), which both spend more time flying at heights within the collision risk zone.

The CRM for sparrowhawk was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 81 years (weighted, 98% default avoidance). Notwithstanding the limitations associated with CRMs and sparrowhawk detectability, this level of turbine mediated mortality would be totally imperceptible to background levels.

As detailed in the species account (Section 7.3.5.1), to generate a predicted collision risk of 1 collision every 35 years the CRM requires an over 2 fold increase in the amount of flight time recorded within the CRZ, i.e. 1,800 seconds (785 seconds actually recorded). Based on an adult survival rate of 0.69 for sparrowhawk (BTO BirdFacts[45]) and taking a notional population estimate of 350 birds for Co. Tipperary, additional annual mortality required to exert a 1% effect at the county level would have to be at least 1 collision per year. This would require inputting an eighty fold increase in flight time (6,280 seconds), which is high for this species. Therefore, it can be

[45] BTO BirdFacts – Sparrowhawk: https://www.bto.org/understanding-birds/birdfacts/sparrowhawk

objectively concluded that predicted levels of collision risk, even with adjustments to account for the difficulties associated with sparrowhawk detectability, will almost certainly be negligible in effect. No significant (> 1%) population level effects are anticipated, based on the measured and adjusted level of predicted collision risk.

7.4.4.24 Buzzard – Likely operational phase effects

Buzzard - Operational habitat loss

The Proposed Project Site and associated 2 km proposed turbine buffer supports three pairs of buzzards. One of the breeding sites, located within the T-shaped woodland south of T04 will be lost to felling required to facilitate the proposed infrastructure. However, a single pair of buzzards can have 10 or more alternative nest sites within its breeding season home range, with two to four alternative nests being more typical (Brown & Amadon, 1986). Therefore, buzzards are considered to be relatively tolerant of felling operations (out of the breeding season) and should readily relocate to an alternative site in the remaining woodland/treelines adjacent to any felled areas.

Woodland and treelines do offer potential nesting opportunities for this species, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for buzzard. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Buzzard - Operational disturbance/displacement

In terms of sensitivity of nesting pairs due to operational turbines and disturbance and/or displacement effects, surveyors from APEM Woodrow monitoring active wind farm sites across Ireland have identified several pairs nesting in close proximity to turbines, within 500 m. The closest nesting pair recorded occupied a small linear oak-hazel woodland within 190 m of a turbine and had moved into the nesting location in Year 3 post-construction. For the Proposed Project Site, while a nesting option in the T-shaped woodland in proximity to T04 will be lost, it is anticipated that the pair will re-locate to an alternative nest site within their home range and any displacement will be localised. Overall there will be no significant long-term displacement effects on pairs breeding in the area. Obviously, nesting in close proximity to turbines carries an increased risk of collisions, especially for young recently fledged birds that are mastering their power of flight and likely to be naïve to the threats posed by turbines. Two buzzard fatalities (uncorrected for scavenger removal/observer rates) were attributed to collisions with turbines over four years of post-construction monitoring at the aforementioned wind farm site – see following section on collision risk.

In relation to flight behaviour, Pearce-Higgins et al. (2009) suggest that buzzard showed reduced flight activity and avoided an area of 500 m around turbines. This displacement effect may be pronounced immediately after construction and in the first few years of the operational phase. However, it is emerging that some species, including buzzard, develop tolerance to active turbines over time, which may result in a lag time of 2-3 years before the manifestation of post-construction collision related fatalities – see following section on collision risk. A post-construction study by Percival et al. (2018b) found buzzard flights within 100 m of the wind turbines were reduced by 52% in comparison with the 500 m-1 km mean. Beyond 100 m, flight activity was above the 500 m-1 km mean level, indicative of a lack of evidence of displacement of flights further than 100 m from the turbines. This result is supported by preliminary findings from a Bulgarian study using GPS tracking to investigate buzzard flight behaviour in relation to turbines (Zehtindjiev et al., 2023), which has recorded 200 fixes within a 20 m radius of turbines, 2,285 fixes within a 100 m radius of turbines and 53,400 fixes within a 500 m radius of turbines.

Often habitat conditions within post-construction wind farm sites, e.g. felled areas, tracks and habitat management areas, creates good foraging habitat for buzzards and may actively attract birds into the site, increasing the potential for collisions to occur. Similarly, post-construction monitoring studies investigating scavenging rates on wind farm site have recorded buzzard as one of the species regularly undertaking the

scavenging (e.g. Percival et al. 2018a, 2018b & 2018d), which suggests that availability of carcasses below turbines could also draw buzzard foraging activity closer to turbines.

Overall it is considered that foraging and (probably) breeding buzzard do not appear to suffer displacement effects from operational turbines. Therefore any significant disturbance and/or displacement effects are assessed as unlikely, and collision risk is the main consideration for this species.

Buzzard - Collision risk

Buzzards are a species emerging as notably susceptible to colliding with turbines and are one of the most commonly reported species as victims of turbine mediate mortality (Dürr, 2023). This is acknowledged within the collision risk model, which is run with a lowered avoidance rate (98% default avoidance rate). For the Proposed Project the modelled outputs for predicted collision risk are high, estimating just under one collision per year; however are considered to accurately represent the risk based on recorded flight activity and are broadly in line with the results of post-construction collision monitoring studies. For example, Percival et al. (2018a & 2018d) undertaking carcass searches across a 16 turbine site over three years recorded 1 buzzard collision over three winter search periods and 1 buzzard collision over three breeding season search periods, equating to a mean of 0.33 collisions per winter or breeding season, i.e. 0.67 collisions per annum. Applying correction factors to allow for seasonal carcass removal rates and searcher efficiency, the values were adjusted to 1.3 and 1.6 collision per annum for the breeding season and winter search periods, respectively. The monitoring reports conclude that collision rates were well below levels at which they could "*possibly be biologically significant*" (Percival et al., 2018a & 2018d).

The CRM for buzzard was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 30 collisions over 35 years (weighted, 98% default avoidance), which is relatively high and is reflective of the high levels of flight activity recorded. The potential for predicted buzzard collision risk at a rate of 0.86 collision per annum to have a > 1% population level effects above background mortality was tested by applying an annual survival rate of 0.9 for adult birds and 0.63 for juveniles (BTO BirdFacts[46]) to a local population estimated at 6 adult birds and 6 juveniles (< 3 years old). For the local population the high rate of adult survivorship for buzzard drives a 144% increase in annual mortality, with a lower level of 39% increased mortality generated for juvenile birds. If considering magnitude of effect at a regional level on a population notionally estimated at > 90 buzzards, then any population level effects diminishes in significance around to 10% additional mortality – see Table 7H.24 in Appendix 7H.

In assessing magnitude of effect, further consideration is given to the exponential increase of the Irish buzzard over the last 20 years, which is still expanding into new areas; seemly only limited by the availability of nesting habitat, typically in trees (Lusby, 2011, Balmer et al. 2013). The success of buzzards in Ireland can be attributed to having notably high fecundity for a raptor (capable of regularly fledging broods of 4 young); and the species' ability to exploit numerous food sources, ranging from carrion, worms and larger more mobile prey items like rabbits. Buzzards also employ a variety of foraging techniques (e.g. sitting in tree or active hunting flights), depending on habitat, seasonality and prey types, which has allowed them to expand into a wider range of ecological niches when compared to other raptors.

Predicted collision risk is anticipated to have likely significant effects on the local breeding population; however in the context of an expanding buzzard population in Ireland any additional mortality will have a moderate effect (c. 10%) on the regional buzzard population, which will recruit into the local area and replace any birds periodically lost to turbine mediated mortality. Based on Percival (2003), taking a low sensitivity[47] for buzzard and a moderate:

[46] BTO BirdFacts – Buzzard: https://www.bto.org/understanding-birds/birdfacts/buzzard
[47] Note: Technically, based on Percival (2003), buzzard, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as birds of prey occurring at low densities that are susceptible to turbine collisions at the local population level.

6-20% magnitude effect results in an adverse effect of low significance on a locally (higher value) important population (NRA, 2009), over the long-term (EPA, 2022).

7.4.4.25 Long-eared owl – Likely operational phase effects

Long-eared owl - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by long-eared owl that will be lost to the infrastructural footprint of the Proposed Project. Woodland and treelines do offer potential nesting opportunities for this species, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for long-eared owl. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Long-eared owl - Operational disturbance/displacement

During dusk surveys long-eared owls were heard calling from the woodland on the southern boundary of the 500 m proposed turbine buffer and were considered likely to be breeding in the vicinity, with the area of woodland in the southern extent of the Proposed Project Site being suitable for this species. The breeding territory is within 250 m of T10. Based on a recommended breeding season disturbance buffer zone of 100-300 m from long-eared owl breeding sites (Goodship & Furness, 2022), it is likely that part of the breeding territory of this pairs is within the zone of influence of T10. There is limited information on how owls react behaviourally to operational wind turbines; however given the proximity the proposed turbine there is potential for some level of disturbance and possibly displacement effects. Taking a precautionary approach the magnitude of effect on 1 pair is assessed as low: 1-5% (Percival, 2003) given an estimated county breeding population of 50-100 pairs. Based on Percival (2003), taking a precautionary low sensitivity[48] for breeding long-eared owl and a low magnitude effect results in an adverse effect of very low significance on a locally (higher value) important population (NRA, 2009), over the long-term (EPA, 2022). It would be expected that over time long-eared owls will exhibit a level of habituation to the proposed turbines and therefore, the temporal magnitude of effects can be lessened to a short-term effect (EPA, 2022).

Long eared owl - Collision risk

Owl species have been identified as being at risk of collision as a result of wind farm developments (Langston & Pullan 2003), due to their size and nocturnal/crepuscular hunting behaviour and long-eared owl collisions with turbines are reported (see Dürr 2023). In the US, Beston et al. (2016) found that long-eared owl fatalities attributable to turbine collisions were > 1.5% and predicted potential for population decline. In contrast, a review of mortality in long-eared owls (Erritzøe, 1999) highlighted that vehicle collisions are generally considered to be the human induced factor contributing most significantly to long-eared owl mortality. Predation of fledged young is another factor noted as significantly contributing to mortality in some populations (Tome, 2011).

Due to their nocturnal habits long-eared owls were not observed flying within the 500 m proposed turbine buffer and no CRM was run of this species. There are only two proposed turbine locations (T09, T10) in the southern part of the site, where the optimal long-eared owl habitat occurs and these are positioned beyond the main blocks of woodland, so commuting or foraging owls should be able to avoid them. Given the favourable (green listed) conservation status of long-eared owls (Gilbert et al., 2021) and the relatively low risk of collisions occurring on a regular basis, it is concluded that collision related mortality is not likely to significantly (> 1%) impact this species locally, regionally or nationally.

[48] Note: Technically, based on Percival (2003), long-eared owl, as a species with favourable conservation status, would fall below the level requiring assessment; however was assigned low sensitivity in the assessment on a precautionary basis as birds of prey occurring at low densities that are susceptible to disturbance at the local population level.

7.4.4.26 Swift – Likely operational phase effects

Swift - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by swifts that will be lost to the infrastructural footprint of the Proposed Project. There is no suitable nesting habitat within Proposed Project Site and swifts utilise the 500 m proposed turbine buffer for foraging over the summer. Foraging birds are likely to be attracted to the River Suir and its floodplain at certain times to capitalise on the emergence of invertebrates associated with wetland habitats. The proposed infrastructure avoids the floodplain; therefore it is considered very unlikely that invertebrate resources associated with this habitat will be affected by the Proposed Project. No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Swift - Operational disturbance/displacement

Swifts readily habituate to manmade structures, and it is considered unlikely that foraging birds will be displaced by operational turbines. Conversely swift, along with species of hirundine[49], that exhibit similar foraging behaviour, may be actively drawn towards turbines to glean insects that are attached to/more active around turbine towers and hardstands (Rydell *et al*., 2012).

As there are no breeding sites within the Proposed Project Site and due to the apparent low avoidance rate shown by this species, no likely significant effects due to disturbance and/or displacement caused by operational turbines are anticipated.

Swift - Collision risk

As mentioned in the previous section, swifts may be attracted to turbine towers and this behaviour could result in heightened collision risk for this species. In Germany 3% of 1,192 reported fatalities due to collisions with wind turbines between 1989 and 2010 were swifts, which when combined with swallow mortality was proportionally higher than would be expected for small, fast-flying and mobile species like swifts and hirundines (Dürr, 2010 in Rydell *et al*., 2012). A review of bird collisions with turbines in South Africa (Perold et al., 2020) also found that swift species (Apodidae) featured prominently and were the third most frequently killed family of birds after the diurnal raptors (Accipitridae and Falconidae). In contrast with Rydell et al. (2012), fatalities for other species with similar foraging habits, i.e. aerial insectivores like swallows and martins (Hirundinidae), were noted as being relatively low despite high abundances of these species occurring in the region.

As detailed in the species account for swift in Section 7.3.6.1, a series of CRMs were run to test a range of hypothetical flight times. Depending on the amount of flight seconds entered into the CRM, predicted collision risk ranged from 0.08 to 16.7 collisions per annum.

Based on the hypothetical flight times applied within the CRM, taking the middle scenario for flight time (162,853 seconds resulting in 8 collision per annum), a regional swift population of 500 birds and applying an annual survival rate of 0.808 (BTO BirdFacts[50]), indicates that there is potential for a moderate: 6-20% (Percival, 2003) population level effect on the regional swift population. This constitutes a highly precautionary assessment, as swift were only occasionally recorded in large flocks (up to 25 birds) required to generate this level of flight time. In addition, default (98%) avoidance was applied in the absence of species specific avoidance rate.

Therefore, based on Percival (2003), adopting a precautionary approach in the absence of robust flight time data, and taking a medium sensitivity for swift and a moderate: 6-20% magnitude effect results in an adverse effect of low significance on a regionally important population (NRA, 2009), over the long-term (EPA, 2022).

[49] Hirundines are birds in the swallow family, which in Ireland includes the following summer visitors (barn) swallows, house martins and sand martins, as well as the occasional red-rumped swallows on passage.
[50] BTO BirdFacts – Swift: https://www.bto.org/understanding-birds/birdfacts/swift

7.4.4.27 Stock dove – Likely operational phase effects

Stock dove - Operational habitat loss

There are no important habitats with a limited distribution or availability utilised by stock dove that will be lost to the infrastructural footprint of the Proposed Project. Woodland and treelines do offer potential nesting opportunities for this species, and while areas of potential suitable nesting habitat will be removed to facilitate construction of the Proposed Project, it is considered that areas of suitable habitat will remain to provide alternative nesting locations for stock dove. It was noted that arable production was limited in the immediate area, which is a factor likely to limit the occurrence of this species at higher densities.

No likely significant effects are anticipated to occur as a result of long-term habitat loss.

Stock dove - Operational disturbance/displacement

Over the study period there was only one record of an individual bird in the southern woodland noted as possibly breeding within the 500 m proposed turbine buffer. The majority of post-construction monitoring studies reviewed, including Percival et al. (2009a, 2009b, 2011b, 2015a) suggest that breeding density and distribution around operational turbines is largely unaffected. There were two post-construction studies (Percival et al, 2011a, 2016b) where there was a slight decrease in the number of pairs recorded once the wind farm was operational; however these were likely to be the result of habitat alteration in the area rather than being caused by the proximity of the turbines.

Therefore, no significant (> 1%) disturbance or displacement effects due the Proposed Project once operational are anticipated for breeding pairs or foraging stock doves.

Stock dove - Collision risk

Stock doves are reported as colliding with turbines (Dürr, 2023). Columbidae (pigeons and doves) as a family exhibit flocking behaviour and very direct flight patterns that may make them susceptible to collisions, especially some of the larger, less agile species. For example, wood pigeons are one of the most commonly reported bird colliding with turbines, although this high incidence rate is probably also influenced by wood pigeons being a very common and widely distributed species.

No stock dove flights were recorded within the 500 m proposed turbine buffer, due to the low occurrence of this species in the area. Therefore, the likelihood of any collisions occurring is very low and does not present any significant (> 1%) population level effect to the stock dove population.

7.4.4.28 Red listed and amber listed passerines – Likely operational phase effects

According to SNH (2017):

"*It is generally considered that passerine species are not significantly impacted by wind farms*."

However, due to unfavourable conservation status, red and amber listed passerines were included in the assessment of operational effects on a precautionary basis to provide a robust and thorough assessment of likely significant effects.

Four red listed passerine species were recorded within the 500 m proposed turbine buffer, including redwing (wintering), grey wagtail (probable breeding/wintering), meadow pipit (breeding/wintering) and yellowhammer (two pairs). There were 11 amber listed passerine species recorded during the survey period, five species were recorded breeding within the Proposed Project Site, including skylark that nest on the ground in grassland habitats and goldcrest, linnet, spotted flycatcher and willow warbler that breed in a range of different woodland and scrub habitats, including hedgerows and treelines. The other amber listed species were recorded foraging within the 500 m proposed turbine buffer, including brambling, house martin, house sparrow, sand martin, starling and swallow.

All red and amber listed passerine species were assessed as having local (higher value) importance (NRA, 2009). For the assessment of effects, these the species can be broadly divided into the following categories:

- Wintering only species: redwing and brambling
- Riverine species: grey wagtail
- Ground nesting species: meadow pipit and skylark
- Species nesting in woodland, scrub, treelines and hedgerows: yellowhammer, goldcrest, linnet, spotted flycatcher and willow warbler
- Foraging only species: house martin, house sparrow, sand martin, starling and swallow

Passerines - Operational habitat loss

For all passerine species recorded utilising the Proposed Project Site, including green listed species, there are no important habitats with a limited distribution or availability that will be lost to the infrastructural footprint of the Proposed Project. Areas of potential suitable nesting habitat in woodland, scrub, treelines and hedgerows will be removed to accommodate the infrastructure of Proposed Project; however, it is considered that areas of suitable habitat will remain to provide alternative nesting locations, as well as foraging opportunities for wintering species like redwing and brambling. Clearance of plantations has the potential to create nesting cover for ground nesting species like meadow pipit. For grey wagtails any of the more substantial drain crossings have the potential to create nesting cover, e.g. in the rock armouring associated with culverts.

No likely significant effects on breeding or wintering passerines are anticipated to occur as a result of long-term habitat loss.

Passerines - Operational deterioration in water quality

As assessed for construction related impacts, grey wagtails are sensitive to deterioration in water quality. In the absence of mitigation to protect water quality during the operational phase of the project, there is potential for negative impacts on the grey wagtails utilising downstream areas for foraging. The magnitude of population level effect, caused by indirect pollution effects on 1 pair, would be negligible: < 1% (Percival, 2003), given an estimated county breeding population of 500 pairs. Based on Percival (2003), taking a medium sensitivity for breeding/wintering grey wagtail and a negligible magnitude effect results in an adverse effect that is not significant on a locally (higher value) important population (NRA, 2009), over the long-term (EPA, 2022). Furthermore, based on the requirements of other ecological sensitivities, best practice mitigation will be in place during the operational phase to protect water quality.

Passerines - Operational disturbance/displacement

Information on the effects of operational wind farms on populations of smaller passerines in an Irish or UK context are limited compared to studies on larger, more sensitive species, such as eagles and hen harriers. Some studies find limited effects of active turbines on passerine assemblages (e.g. Devereux et al., 2008, Stevens et al., 2013), with others reporting localised displacement effects (e.g. Pearce-Higgins et al., 2012, Wilson et al., 2015, Shaffer & Buhl, 2016, Fernández-Bellon, et al., 2019). In reviewing displacement effects of wind turbines, Tolvanen et al. (2023) found that displacement effects were more commonly attributed to the breeding component of the population, as opposed to wintering birds where some of the studies note no effect (e.g. Stevens et al., 2013). In terms of magnitude of effects, the passerine populations in question would need to occur in low densities and threatened for significant population level effects to occur. This is highlighted by a study investigating the effects of wind farms on a threatened passerine - Dupont's lark (Gómez-Catasús et al., 2018). This study found that wind farms can have a significant and deleterious impact, with a magnitude of annual decline four times higher than for similar populations occurring in control areas without wind turbines and displacement effects extending out 4.5 km.

Generally, passerines are considered to exhibit low levels of sensitivity to ongoing operational disturbance at wind farms and where detected, effects are typically of limited extent only exerting an influence over 100–200 m from

turbines, as reviewed in Pearce-Higgins et al., (2012). Breeding densities of some species including meadow pipits and skylarks were found by Pearce-Higgins et al. (2012) to exhibit potential positive effects of wind farm construction. These findings contrast somewhat to those Fernández-Bellon et al. (2018) who suggest based on studying bird populations at Irish wind farms, that large wind farms held lower densities of open-habitat species such as meadow pipit, skylark and wheatear. However, this study lacked the pre-construction comparative surveys employed in Pearce-Higgins et al. (2012). A review of post-construction monitoring studies, including Percival et al. (e.g. 2009b, 2009c, 2015a, 2016a, 2016b), found that breeding densities of meadow pipit and skylark within 300 m of turbines remained comparable between pre- and post-construction survey, with one exception noted where meadow pipit densities declined (Percival et al., 2011b). In this instance, changes in land use from grassland to tillage were implicated, rather than turbine induced displacement effects.

Overall the Proposed Project supports relatively low densities of ground nesting species including c. 40 meadow pipit territories and c. 10 skylark territories, which are largely located more than 100 m from the proposed infrastructure. Likewise, the southern woodland supporting breeding spotted flycatcher (1 pair) and the yellowhammers (2 pairs) on the eastern periphery of the 500 m proposed turbine buffer will be avoided. Amber listed woodland/scrub nesting species, like goldcrest and willow warbler are widespread and are unlikely to be adversely affected by operational turbines.

Therefore, with consideration given to the overall small number of birds potentially affected in the context of common and widespread populations, the low sensitivity of receptors, the discreet nature of the Proposed Project within the wider landscape and the availability of alternative nesting, roosting and foraging areas, the potential for displacement effects on red and amber listed passerines are assessed as imperceptible and therefore not significant (EPA, 2022).

Passerines - Collision risk

Globally, incidental records and systematic post-construction turbine searches have recovered a wide range of passerine species as casualties of collisions with turbines (e.g. Erickson et al., 2014, Dürr, 2023). The passerine species recorded utilising the Proposed Project Site, or similar species, have all been documented as having suffered collisions with operational turbines – see Table 7-13. In terms of population level effects, the high productivity/fecundity of most passerines means that the typically large size of passerine populations means they are unlikely to be affected to any significant degree by turbine mediated mortality. Erickson et al. (2014) analysing small passerine fatalities due to turbine collisions across the USA and Canada found that for the species assessed, the cumulative mortality rate was substantially lower than 1% (range: 0.04% to 0.008%), i.e. indicating that population level effects on small passerines due to collisions with turbines are likely to be imperceptible for most passerines.

In addition, many of the species moving through the Proposed Project Site, especially scrub and woodland nesting birds are likely to be doing so at an altitude below collision risk height. In relation to migrating birds that may be flying at collision risk heights, studies employing radar and observer effort, found that passerines on migration tended to undertake flight trajectories at heights above the collision risk zone, especially overnight; and when confronted with turbine arrays during the day birds have been observed employing macro-avoidance, i.e. flying around or over turbines (e.g. Blew et al, 2008, Krijgsveld et al., 2011, Lindeboom et al., 2011).

A detailed collision risk study conducted in the Netherlands using radar to track bird movements (see Krijgsveld et al., 2009) did record a single redwing fatality. However, the density of birds tracking through the zone of collision risk (including redwing and other thrushes) and the actual number of collisions recorded was substantially lower than expected. This was suggestive of high levels of avoidance, even during conditions when collision risk was considered high, e.g. nights with poor visibility due to low cloud and rain. Therefore, no significant population level impacts are anticipated in terms of operational disturbance or due to collision risk for redwings.

A study conducting turbine searches at wind farms across northern Portugal found that breeding skylarks were the species with the highest overall mortality in heathland habitats; and suggested this was related to the display flights undertaken by male skylarks, which increases susceptibility to collision risk (Morinha et al., 2014). This finding was based on spring turbine searches conducted at 9 wind farms (82 turbines), with c. 100 search visits (c. 900 turbine searches) generating 22 skylark carcasses. The authors used factors to correct for searcher efficiency and carcass removal rates by scavengers to provide a figure for 'real mortality'. This was found to be of a higher order of magnitude (225 collisions) and was considered capable of having long-term impacts on demographics (c. 90% of birds killed were male) and abundance. These results are supported by raw collision data collected from wind farm across Germany, as reproduced in **Table 7-13** based on Dürr (2023), which shows that substantially more skylark collision have been report than for meadow pipits.

Utilising the same data as Morinha et al. (2014), Bastos et al. (2016) ran population models for northern Portugal, which showed that the average local impact for collision on breeding skylark would increase over time, i.e. as the local population declines due to effects driven by a range of environmental factors (such as climate change) and the magnitude of effect on the local breeding pairs increases due to turbine mediated mortality. The modelling predicted that direct impacts from operational wind farms on the local breeding populations would increase from 1.3%/km^2 in 2006 to 4%/km^2 in 2026. Accounting for all the wind farms in the region, the modelling also generated predicted regional cumulative impacts which increased from 1.2% to 3.7% of the total estimated breeding individuals. Based on Percival (2003) this magnitude of effect on either the local or the regional population would be classed as Low: 1-5% population effect.

Another amber listed species regularly occurring within the Proposed Project Site were goldcrests. A study (Aschwanden et al., 2018) conducting systematic searches below three turbines (n = 85 searches) in the Swiss Jura mountains found that kinglets/crests (*Regulus* species) represented 55% of the fatalities (n = 11 collisions), with the majority of the collisions attributed to nocturnally migrating passerines.

The relatively small passerine populations supported by the Proposed Project Site, classed as having locally (higher value) importance, are generally considered common and widespread in Ireland (Crowe et al., 2014 & Lewis et al. 2019a). Although some species are experiencing unfavourable conservation status, in terms of population dynamics it can be objectively concluded that that while a level of turbine mediated fatality will occur over the life time of the Proposed Project, these populations are not considered susceptible to collision risk. There are no very rare species occurring in small numbers where collision risk might have a heightened population level effect locally. The high reproductive rates of passerines means they are unlikely to be affected to any significant degree by the Proposed Project once operational, and the magnitude of the effect would be classed as negligible on populations of either low (amber listed) or medium (red listed) sensitivity (Percival, 2003). Therefore impacts on red and amber listed passerines during the operational phase of the project are considered to be not significant.

Table 7-13: Bird losses at wind turbines in Germany - passerines and other selected species

Source: Dürr (2023)

Species	Latin name	Collisions (raw data)
Wood pigeon	*Columba palumbus*	196
Feral pigeon	*Columba livia* f. *domestica*	91
Stock dove	*Columba oenas*	18
Pigeon spec.	*Columba* species	5
Collared dove	*Streptopelia decaoctao*	3
Carrion crow	*Corvus corone*	53
Raven	*Corvus corax*	26
Crow spec.	*Corvus spec.*	11
Jay	*Garrulus glandarius*	10
Jackdaw	*Coloeus monedula*	6
Rook	*Corvus frugilegus*	6

Species	Latin name	Collisions (raw data)
Magpie	*Pica pica*	5
Great tit	*Parus major*	12
Blue tit	*Cyanistes caeruleus*	7
Long-tailed tit	*Aegothalus caudatus*	1
Blackcap	*Sylvia atricapilla*	9
Willow warbler	*Phylloscopus trochilus*	8
Chiffchaff	*Phylloscopus collybita*	7
Grasshopper warbler	*Locustella naevia*	1
Sedge warbler	*Acrocephalus schoenobaenus*	1
Whitethroat	*Sylvia communis*	1
Goldcrest	*Regulus regulus*	125

Species	Latin name	Collisions (raw data)
Firecrest	*Regulus ignicapilla*	45
Gold/firecrest spp.	*Regulus* species	12
Treecreeper	*Certhia familiaris*	2
Wren	*Troglodytes troglodytes*	4
Swift	*Apus apus*	170
House martin	*Delichon urbica*	61
Barn swallow	*Hirundo rustica*	29
Sand martin	*Riparia riparia*	7
Swallow spp.	*Hirundidae* species	1
Starling	*Sturnus vulgaris*	96
Song thrush	*Turdus philomelos*	27
Blackbird	*Turdus merula*	18
Fieldfare	*Turdus pilaris*	18
Mistle thrush	*Turdus viscivorus*	10
Redwing	*Turdus iliacus*	4
Robin	*Erithacus rubecula*	38

Species	Latin name	Collisions (raw data)
Wheatear	*Oenanthe oenanthe*	3
Whinchat	*Saxicola rubetra*	3
Skylark	*Alauda arvensis*	125
Meadow pipit	*Anthus pratensis*	1
White wagtail	*Motacilla alba*	11
Tree sparrow	*Passer montanus*	29
House sparrow	*Passer domesticus*	5
Chaffinch	*Fringilla coelebs*	17
Greenfinch	*Chloris chloris*	9
Goldfinch	*Carduelis carduelis*	4
Linnet	*Linaria cannabina*	2
Redpoll	*Acanthis flammea*	1
Yellowhammer	*Emberiza citrinella*	35
Reed bunting	*Emberiza schoeniclus*	5
Passerine spp.	Passeriformes species	25

7.4.5 Summary of likely significant effects – operational phase

For the bird species assessed, significant (> 1%) effects during the operational phase were ruled out for the following species: black-headed gull, whooper swan, shoveler, curlew, mute swan, wigeon, mallard, teal, woodcock and stock dove; as well as four red listed species of passerine, including: redwing, meadow pipit, grey wagtail and yellowhammer, and 11 amber listed species of passerine, including: brambling, goldcrest, house martin, house sparrow, linnet, sand martin, skylark, spotted flycatcher, starling, swallow, willow warbler.

7.4.5.1 Operational phase - habitat loss

For the avian species assessed no likely significant effects are anticipated to occur as a result of long-term habitat loss. There are no important bird habitats with a limited distribution or availability that will be lost to the footprint of the Proposed Project.

The footprint of the infrastructure for the Proposed Project has been designed to avoid any substantial long-term loss of habitats utilised by sensitive bird species. In particular, areas of wetland habitat, including wet grassland are avoided and these are the areas identified as being utilised by a range of wintering waterbirds, breeding waders (lapwing and snipe) and other ground nesting species, including meadow pipit and skylark. In addition, loss of woodland, treelines, hedgerow and scrub habitats utilised by a range of bird species, has been kept to a minimum and while there will be some habitat loss, enough of these habitats will be retained, so as not to significantly affect baseline densities of bird populations.

7.4.5.2 Operational phase – disturbance/displacement effects

As discussed in the preamble of Section 7.4.4 under *Operational phase - likely secondary effects on ornithological receptors*, no likely significant effects are anticipated to arise due to the proposed turbines having barrier effects (a form of displacement) and this includes, the potential for the Proposed Project to act in combination with other developments in the wider area.

In the absence of mitigation, significant (> 1%) effects during the operational phase due to disturbance and/or displacement effects were identified for the following avian IEFs:

Breeding waders			
High sensitivity species (Percival, 2003):			
Lapwing	Nationally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Medium sensitivity species (Percival, 2003):			
Snipe	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)

Wintering waterbirds			
Medium sensitivity species (Percival, 2003):			
Lapwing	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Golden plover	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)

Birds of prey			
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Long-eared owl*	Locally important (NRA, 2009)	V. low significance (Percival, 2003)	– long-term (EPA, 2022)

7.4.5.3 Operational phase – direct effect: collision risk

There were 23 target species recorded flying within the 500 m proposed turbine buffer. Collision risk models (CRMs) were run for 12 of these species, based on flight time and number of observations recorded within the collision risk zone (CRZ), with additional hypothetical CRMs run for swift. Further hypothetical CRMs were run for three species, snipe, woodcock and sparrowhawk, where collecting representative flight line data is problematic.

Outputs from the CRMs predicted collision risk of 1 or more collisions over 35 years for 8 species including: buzzard, cormorant, golden plover, grey heron, kestrel, lapwing, lesser black-backed gull and little egret. Further analysis found that predicted collision risk would generated a > 1% population level effects for 4 species including: buzzard, golden plover, lapwing, lesser black-backed gulls.

Hypothetical CRMs for snipe, woodcock, sparrowhawk and swift suggested that predicted collision risk would generate a > 1% population level effects for swift and snipe, but not for woodcock and sparrowhawk.

CRM outputs for peregrine predicted 1 collision over 44 years, which would be imperceptible to background levels; however, to account for a level of uncertainty around collision risk to recently fledged birds a > 1% population level effect was assumed as a conclusion of the assessment.

Likely significant effects during the operational phase due to predicted collision risk were identified for the following avian IEFs:

Breeding waders			
High sensitivity species (Percival, 2003):			
Lapwing	Nationally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Medium sensitivity species (Percival, 2003):			
† indicates a precautionary assessment based on additional analysis			
Snipe†	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)

Wintering waterbirds			
Medium sensitivity species (Percival, 2003):			
• indicates that predicted collision risk also applies over the breeding season			
† indicates a precautionary assessment based on additional analysis			
Lapwing •	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Golden plover	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Snipe •†	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Lesser b-b gull •	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)

Birds of prey

Medium sensitivity species (Percival, 2003):			
† indicates a precautionary assessment based on additional analysis			
Kestrel	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Peregrine†	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Buzzard*	Locally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)

Other non-passerines			
Medium sensitivity species (Percival, 2003):			
† indicates a precautionary assessment based on additional analysis			
Swift†	Regional important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)

7.4.5.4 Operational phase – deterioration in water quality

In the absence of mitigation, likely significant effects during the operational phase due to deterioration in water quality were identified for the following avian IEFs:

Riverine species			
Medium sensitivity species (Percival, 2003):			
Cormorant	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Kingfisher	Regionally important (NRA, 2009)	Med significance (Percival, 2003)	– long-term (EPA, 2022)
Little egret	Regionally important (NRA, 2009)	Low significance (Percival, 2003)	– long-term (EPA, 2022)
Low sensitivity species (Percival, 2003):			
* indicates species with favourable conservation status assigned low sensitivity on a precautionary basis			
Grey heron*	Regionally important (NRA, 2009)	V. low significance (Percival, 2003)	– long-term (EPA, 2022)

7.4.6 Decommissioning Phase

Decommissioning phase effects are likely to be broadly similar to effects assessed for the construction phase, in terms of disturbance through increased noise levels, ground clearance works, and reinstatement. There will also be the potential for surface water quality impacts from ground disturbance, refuelling and the storage of potentially hazardous materials onsite. Certain aspects of activities occurring during the construction phase are anticipated to occur at reduced levels during decommissioning, such as excavation of turbine foundations that will be left in situ and covered with soil for reinstatement. Access tracks will also remain for ongoing usage as farm and forestry tracks. In addition, the use of building materials, including concrete and aggregates will not be required.

The proposed grid route and on-site substation will be taken in charge of by the system operator and will remain in situ. It is unlikely that enabling works along the TDR will be required during the decommissioning phase.

As with construction the main concerns are likely to relate to disturbance during times when the species are most vulnerable, notably the breeding season. In addition, because decommissioning will not occur for some decades, there is a possibility that other bird species, not recorded during this survey may be in the area.

7.4.7 Cumulative Effects

Cumulative effects relate to the addition of many minor or insignificant effects, including effects of other projects or plans, which when considered together may create more of a significant effect. A list of proposed and approved/permitted developments assessed in the EIAR for cumulative impact assessment with the Proposed Project is provided in Section 16.4.6.2 in Chapter 01: Introduction.

SNH (2018c) provides guidelines for the assessment of cumulative impacts and the effects of onshore wind farms on ornithological receptors. These guidelines recommend taking an additive approach to the assessment of

cumulative effects, which sums the impacts from different developments and can provide a quantitative assessment in relation to cumulative collision risk. It is noted that is some instances the additive approach may be too simplistic to fully account for cumulative effects, given the complex ecological life histories of some species, especially when assessing the effects of disturbance. A qualitive assessment is likely to be more appropriate in some cases and this can rely on the application of professional judgement and further information provided in the desk study or for example by wider area wintering waterbird surveys.

The following sections, firstly identify other plans and projects for consideration and subsequently assess the potential for the occurrence of additive impacts on avian IEFs.

7.4.7.1 Scope of cumulative effects assessment

The following plans were reviewed as part of the cumulative impact assessment:

- Tipperary County Development Plan 2022-2028[51]
- Mid West Area Strategic Plan 2012-2030[52]
- Thurles and Environs Local Area Plan 2024-2030[53]

Upon reviewing the location of other projects potentially entering construction phases along the same timelines as the Proposed Project, as well as the sensitivities of ornithological receptors occurring in the area, it was determined that any short-term impacts related to construction disturbance could be scoped out of the cumulative ornithological assessment, with the exception of a permitted agricultural shed (TCC ref: 2460134) adjacent to the peregrine breeding site at Brittas. All permitted developments requiring construction works are relatively small with discrete footprints, and were found to be beyond the zone of influence for the ornithological receptors present and therefore highly unlikely to give rise to significant cumulative impacts.

Chapter 9: Water conducts a thorough cumulative assessment in relation to any cumulative impacts on water quality with the potential for cumulative effects on sensitive aquatic bird species and highlights that larger projects/plans within the shared catchment of the Proposed Project are subject to a rigorous design process for obtaining planning permission. Where relevant, these projects/plans have incorporated Construction Environmental Management Plans (CEMPs) and Appropriate Assessments to ensure that there will be no adverse effects on the aquatic environment and therefore do not require further consideration for potential cumulative effects on sensitive aquatic bird species. There were 35 smaller planning projects identified within 5 km of the Proposed Project, including agricultural sheds and shed extensions, livestock facilities, dwelling houses, extensions to dwelling houses, attic conversions, domestic wastewater treatment systems, property entrances and roads, sports facilities, garages, demolitions, and retention permission applications etc. These dispersed small scale domestic and agricultural developments are not expected to have significant cumulative effects with the Proposed Project. These minor projects are either under the threshold for EIA, or excluded from the list of projects requiring EIA. Due to the nature and scale of these applications they will not introduce complex or significant issues and are therefore not considered in the cumulative assessment.

The assessment of cumulative effects in this chapter focuses on cumulative effects likely to occur during the operational phase of the Proposed Project, focussing specifically on the potential for any adverse effects in combination with other proposed and permitted wind farms within 20 km of the Proposed Project. This distance is considered an appropriate scale for the avian IEFs occurring in the environs. Consideration is also given to other projects or plans resulting in substantial areas of habitat loss and/or extensive disturbance with the potential for cumulative effects on birds, in particular habitat loss/habitat alteration occurring as a result of solar farms.

[51] Accessed via: https://www.tipperarycoco.ie/planning-and-building/development-plan-consultation/tipperary-county-development-plan-2022-2028
[52] Accessed via: https://www.limerick.ie/sites/default/files/media/documents/2017-03/Mid%20West%20Area%20Strategic%20Plan%202012-2030.pdf
[53] Accessed via: https://www.tipperarycoco.ie/sites/default/files/2024-03/Thurles%20Local%20Area%20Plan%202024%20Written%20Statement_0.pdf

For ornithological impact assessments pertaining to wind farm developments, one of the main considerations in terms of likely significant effects due to cumulative impacts is the influence of the Proposed Project together with other wind farm developments on displacement, barrier or collision effects. Wind farm sites that have been proposed, recently consented, are under construction or that became operational over the period of the ornithological baseline study are considered. Table 7-15 provides a list of wind farm developments with 20 km of the Proposed Project Site and shows that:

- 88 turbines were operational pre-2020
- 10 turbines became operational during the baseline period (2020-2023) – Lisheen III(8) & Ballincurry(2)
- 22 turbines were under construction – Upperchurch
- 9 turbines recent permitted – Borrisbeg

Note: The nine turbines under construction for Farranrory Wind Farm, Co Tipperary are just beyond the 20 km from the Proposed Project Site and thus were not included as part of the cumulative impact assessment.

In addition to the potential cumulative effects of turbine mediated mortality, the only other development where direct cumulative effects on ornithological receptors could reasonably be foreseen is an incomplete section (c. 6.94 km) of an overhead 38 kV electricity line (OHL) that runs between the Borrisoleigh substation and the Thurles substation (ABP-310934-21 - TCC ref: 08/511136). As shown in Figure 2-22 in Chapter 02: Project Description, the route for the incomplete OHL traverses the Proposed Project Site. This introduces a risk of collision for birds flying through the area, as well as a risk of electrocution. The permitted route narrowly avoids the area along the River Suir within the Proposed Project Site that was identified as supporting the highest densities of wintering waterbird activity, breeding snipe and breeding lapwing, whilst avoiding any significant removal of woodland habitats and maintaining a 750 m buffer to the peregrine breeding site. The Applicant for the Proposed Project, in consultation with ESB, will submit a separate planning application to Tipperary County Council for the rerouting of this overhead electricity line through the wind farm site. As outlined in Chapter 04: Alternatives of the EIAR, one of the possible rerouting options includes an underground option that would be buried within the proposed infrastructure. This would have a positive cumulative effect in reducing collision risk across the Proposed Project Site. This EIAR has assessed the potential effects of rerouting this OHL as part of the Proposed Project and therefore an assessment of cumulative effects is not applicable.

In terms of the potential for cumulative displacement of sensitive ornithological receptors, other projects or plans resulting in loss of important habitats and/or extensive disturbance effects were examined. This included a number of solar farms within 20 km of the Proposed Project Site, and as listed in Table 7-16, a total of 8 permitted, but yet to be constructed, solar farm sites were identified.

In terms of future habitat loss and potential disturbance factors, the Thurles and Environs Local Area Plan 2024-2030 provides details of Strategic Roads Investment Projects Plans for the area, and shows the indicative route for the Thurles Bypass. The indicative route for the bypass loops around the eastern side of Thurles and joins up with the N62 north of the town where it crosses the River Suir and passes along the southern boundary of the Proposed Project Site. The route is aspirational at this stage and cannot be fully considered within the assessment of cumulative effects.

7.4.7.2 Cumulative barrier effect

Likely significant effects resulting from barrier effects due to the Proposed Project were assessed at an earlier stage, as discussed in the preamble of Section 7.4.4 : *Operational phase – likely significant effects*. In summary, wind farms, especially considered cumulatively, can create significant barrier effects on birds moving through an area, especially if located on a migration route or between foraging and roosting/breeding habitats. Barrier effects are a form of displacement typically considered for large arrays of turbines spread over a wider geographic area, or concentrated in an important location, e.g. on an important migration route (Humphreys et al. 2015). In response to novel objects, birds will adjust flight paths and/or flight heights in order to avoid the perceived threat.

For birds on migration or making daily flights between foraging and roosting/breeding sites, taking this detour is likely to have energetic costs with the potential to affect condition, including reproductive fitness (e.g. Marden et al., 2009).

Considered in isolation, the dimension and spacing of the turbine array for the Proposed Project does not form an excessively elongated or dense barrier effect to bird populations utilising or moving through the area. The minimum separation distances between existing operational wind farms (c. 9 km), consented/under construction wind farms (Upperchurch: c. 17 km) and proposed wind farms (Borrisbeg: c. 12 km) is sufficient to allow free movement of birds through the region and is unlikely to act as barrier. In addition, there is no evidence to suggest that the Proposed Project Site is on a significant migration route or regularly utilised flight line between any roosting/breeding sites and foraging areas. Therefore, it can be objectively concluded that no likely cumulative barrier effects will arise in combination with other existing, consented or proposed wind farms.

7.4.7.3 Cumulative operational displacement effects

Cumulative displacement effects are assessed for the Proposed Project together with wind farms that have been recently permitted (Borrisbeg), are under construction (Upperchurch) or that became operational over the period the ornithological baseline study for the Proposed Project was being conducted (Lisheen 3). As shown in Table 7-14, disturbance/displacement effects on ornithological receptors are compared across the selected projects to determine the likelihood for cumulative effects and, if possible, a determination on the magnitude of any likely significant effects.

While it is acknowledged that the displacement effects of wind farms are a dynamic force acting on bird populations and, depending on species, will vary in magnitude over time, as well as spatially, for this assessment it is considered that displacement effects for wind farms constructed pre-2020 have been measured and accounted for as part of the ornithological baseline study for the Proposed Project (Oct-2020 to Sep-2023). Therefore, no further consideration is required. In addition, given the age of some of the older wind farm developments, ornithological data and associated impact assessment is deficient for conducting robust cumulative assessment. Nevertheless, this assessment is cognisant of the potential for proceeding projects to contribute to an eroded or impoverished ecological baseline.

Based on the EIS for Upperchurch Wind Farm and Lisheen 3 Wind Farm, which returned assessments of imperceptible effects on sensitive bird species and no potential for impact on all bird species respectively, potential for significant cumulative displacement effects can be discounted. As shown in Table 7-14, in the absence of mitigation, the Proposed Project and Borrisbeg Wind Farm have the potential for cumulative displacement effects on:

- Lapwing - wintering and breeding
- Snipe - breeding
- Golden plover – wintering

Mitigation measures to limit collision risk for wintering golden plover and lapwing at Borrisbeg Wind Farm will aim to displace birds from the wind farm site. Therefore, potential displacement effects on wintering lapwing and golden plover due to the Proposed Project will be in addtion to the displacement effects as a result of mitigation through displacement that will employed at Borrisbeg Wind Farm. One lapwing breeding site at Borrisbeg Wind Farm was avoided during the design phase (mitigation by avoidance) and no displacement effect is anticipated. Therefore, it is concluded that there will be no significant cumulative displacement effects for breeding lapwing. Relatively high levels of snipe activity were recorded at Borrisbeg Wind Farm. However, the number of breeding territories recorded appeared to be very low (1 displaying bird) and almost all of the activity was associated with birds utilising the area outside of the breeding season. The EIAR for Borrisbeg Wind Farm concludes that displacement effects on breeding snipe will be low (1-5%). Based on the numbers recorded, this is a precautionary assessment, and therefore no significant additive effects due to displacement are anticipated.

Habitat loss/alteration due to solar farms has the potential to displace sensitive ornithological receptors. Thus, the potential for cumulative displacement effects of permitted solar farm projects within 20 km of the Proposed Project Site was assessed. The total land take for solar projects within 20 km of the Proposed Project Site amounts to c. 342 ha (Table 7-16). Based on a review of the habitat mapping for these projects, if available, and cross-referencing with up-to-date aerial imagery, the habitat was found to be typical for the region. Most of the solar farm sites were situated within habitats of inherently low ecological value, dominated by improved agriculture grasslands, tillage and conifer plantations also featured on some sites, along with associated higher value features including treelines and hedgerows, with some sites supporting rougher (less improved) grassland habitats, scrub and broadleaf woodland and scrub. Reviewing the ecological assessments for these projects found a ubiquitous conclusion that there would be no likely significant effects on birds, although survey effort to reach these conclusions were generally limited to a small number of site visits and/or a desk study. As shown in Table 7-16, only one solar site notes being within 500 m of a peregrine nest (Solar Farm at Rahelty TCC: 19601012 ABP 306933-20). However, based on separation distance no potential for significant effects was anticipated as a result of the project. The closest point the Proposed Project comes to this peregrine nest is where the underground grid connection route meets the substation, which is > 1.5 km from the nest and beyond the zone of influence for disturbance (Goodship & Furness, 2022).

For solar farms sites out to c. 5 km from the Proposed Project Site, wider area wintering waterbirds surveys confirm low usage. Likewise, breeding raptor survey confirmed that solar sites out to c. 2 km from the Proposed Project Site did not support any sensitive birds of prey. Therefore, it is considered unlikely that habitat/alteration due to proposed/permitted solar farms will have any additive effects on sensitive ornithological receptors identified as potentially experiencing displacement effects due to the Proposed Project.

7.4.7.4 Cumulative effects of collision risk

Predicted collision risk, as calculated using the Band model, is assumed to reflect the level of turbine mediate mortality that will be experienced over the life span of the Proposed Project. If modelled outputs are assessed as presenting a collision risk to sensitive species, i.e. population level effect > 1%, post-construction turbine searches are typically undertaken. These can be used to determine the actual collision rates for a given wind farm. Therefore, as collisions are theoretically a risk throughout the life span of wind farms, cumulative collision risk effects on species needs to consider all the wind farms within the zone of influence selected, 20 km in this instance. As acknowledged in SNH (2018c), this additive approach will not always reflect the complexity of collision risk effects over time. In addition, undertaking a meaningful assessment can be problematic, as there is not always detailed collision risk information available, e.g. for newer wind farms like Lisheen 3 Wind Farm or even sites under construction such as Upperchurch Wind Farm. For both Lisheen 3 and Upperchurch there are no collision risk estimates provided and as such the assessment of cumulative collision risk relies on the statements of significance for these projects, which are imperceptible effects on sensitive bird species and no potential for impact on all bird species, respectively. For operational wind farms bird strike monitoring is often not required and if undertaken the reports are rarely available. This additive approach has not been attempted for the proposed development, as it would only provide a crude assessment of potential for cumulative effects from collision risk.

There are no wind farm sites within 5 km of the Proposed Project Site, with the closest turbines being between 9 km and 15 km away, to the east, where the complex of Lisheen-Bruckana wind farms have 53 turbines combined. Another group of wind farms lies more than 15 km to the southwest of the Proposed Project, including Glenough, Glencarbry, Cappawhite B, Garracummer, Hollyford, Upperchurch. The recently permitted site Borrisbeg, is c. 12.8 km to the north, and the other sites to the south and southwest, which are relatively small clusters of turbines.

As outlined in Section 7.4.5.3, predicted collision risk, in the absence of mitigation was assessed as low significance (Percival, 2003) for lapwing golden plover, lesser black-backed gull and kestrel, with very low significance (Percival, 2003) for buzzard. Further analysis found that potential collision risk of low significance (Percival, 2003) could not be ruled out for snipe, swift and peregrine (recently fledged young). As set out in Section 7.5, mitigation measure are proposed that ensure collision risk remains below acceptable levels for the Proposed Development. Therefore, notwithstanding the clear difficulties in conducting cumulative collision risk assessment, with mitigation measure in place for the Proposed Project and other site in the wider area, it can be concluded that predicted collision risk for the Proposed Project, will not act in-combination with other developments and therefore there will be no significant cumulative population level effects due to combined collision risk.

Table 7-14: Ornithological displacement effects for post-2020 wind farms

Notation: Potential cumulative displacement effects identified for species highlighted in **Bold** text, including lapwing, snipe and golden plover
H = population no longer occurring (whooper swan)
G = although species listed on Annex I Irish population status is favourable (peregrine & little egret)
* = technically would be not assessed under Percival (2003) as species with favourable conservation status (buzzard, sparrowhawk, long-eared owl)

Species	Wind farms assessed with details on magnitude of displacement effects			
Assessed as having likely significant displacement effects	**Proposed project** Assessment NRA (2009), Percival (2003)	**Lisheen 3**[54] Assessment based on Desk study plus 5 site visits	**Upperchurch**[55] Assessment using CIEEM (2019), NRA (2009) & Percival (2007)	**Borrisbeg**[56] Assessment NRA (2009), Percival (2003)
Lapwing - breeding	Nationally important High sensitivity **Low (1-5%)** Low significance	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity **Moderate (6-20%)** Low significance
Lapwing - wintering	County importance Medium sensitivity **Moderate (6-20%)** Low significance	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity **Moderate (6-20%)** Low significance
Snipe - breeding	County importance Medium sensitivity **Low (1-5%)** Low significance	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County Importance Medium sensitivity **Low (1-5%)** Low significance
Snipe - wintering	County importance Medium sensitivity Negligible (< 1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County Importance Medium sensitivity Low (1-5%) Low significance
Golden plover - wintering	County importance Medium sensitivity **Moderate (6-20%)** Low significance	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity **Moderate (6-20%)** Low significance
Long-eared owl - resident	Locally important Low sensitivity * Low (1-5%) V. low significance	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	Not recorded No likely significant effects

[54] Source: Lisheen 3 Wind Farm - Tobin (2014) EIAR: Lisheen III Wind Farm (April 2014): Chapter 8: Ecology - Kilkenny CC ref: 14202, Laois CC ref: 14139, Tipperary CC ref: 14510138 Accessed via TCC ePlan website: https://www.eplanning.ie/TipperaryCC/AppFileRefDetails/14510138/0
[55] Source: Upperchurch Wind Farm - EcoPower (2021) EIAR: Proposed Larger Turbines and Met Masts at Authorised Upperchurch Windfarm (April 2021): Chapter 8: Biodiversity - ABP case ref: PA92.310171 Accessed via An Bord Pleanála website: https://www.pleanala.ie/publicaccess/EIAR-NIS/310171/Environment/2_Environmental%20Impact%20Assessment%20Report%20(EIAR)%202021.pdf?r=794322426421
[56] Source: Borrisbeg Wind Farm – MKO (2023) EIAR Borrisbeg Wind Farm (December 2023) Chapter 7: Ornithology. ABP case ref: 315851-23 Accessed via Borrisbeg Planning website: https://borrisbegplanning.com/home-2/

Species	Wind farms assessed with details on magnitude of displacement effects			
Assessed as having likely significant displacement effects	**Proposed project** Assessment NRA (2009), Percival (2003)	**Lisheen 3**[54] Assessment based on Desk study plus 5 site visits	**Upperchurch**[55] Assessment using CIEEM (2019), NRA (2009) & Percival (2007)	**Borrisbeg**[56] Assessment NRA (2009), Percival (2003)
Little egret	County importance Medium sensitivity - G Negligible (< 1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity Low (1-5%) Low significance
Kingfisher - resident	County importance Medium sensitivity Negligible (< 1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity Low (1-5%) Low significance
Whooper swan	County importance - H Medium sensitivity Negligible (< 1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity Low (1-5%) Low significance
Hen harrier - wintering	Site not important Scoped out - low usage (2 obs. over 3 winters) No likely significant effects	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance High sensitivity Low (1-5%) Low significance
Merlin - wintering	Site not important Scoped out - low usage (6 dates over 3 winters) No likely significant effects	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity Low (1-5%) Low significance
Peregrine - resident	County importance Medium sensitivity - G Negligible (< 1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	County importance Medium sensitivity Low (1-5%) Low significance
Kestrel - resident	County importance Medium sensitivity Negligible (< 1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	Local (higher value) Medium sensitivity Low (1-5%) Low significance
Sparrowhawk	Local (higher value) Low sensitivity * Negligible (<1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	Local (higher value) Low sensitivity Low (1-5%) V. low significance
Buzzard	Local (higher value) Low sensitivity * Negligible (<1%) Not significant	Imperceptible effects on sensitive bird species	No potential for impact on all bird species	Local (higher value) Low sensitivity Low (1-5%) V. low significance

Table 7-15: Wind farms within 20 km of the Proposed Project Site

Wind Farm	Coordinates	Distance from Brittas	Status	Commissioned	Turb. No.	Type
Lisheen 1 Wind Farm Lisheen 2 Wind Farm Lisheen 3 Wind Farm	ITM Easting 621489 ITM Northing 666703	Approximately 9.2 km	Operational	Jul-2009 May-2013 Mar-2023	19 12 8	V90/2000 V90/2000 3 MW
Borrisbeg Wind Farm	ITM Easting 613223 ITM Northing 675090	Approximately 12.8 km	Granted	Pending	9	5.6 MW
Gortnahalla ST	ITM Easting 600024 ITM Northing 662930	Approximately 13.4 km	Operational	Jun-2019	1	Single turbine 0.5 MW
Bruckana Wind Farm	TM Easting 622222 ITM Northing 670498	Approximately 13.5 km	Operational	Jul-2014	14	SWT-3.0-101
Ballinveny Wind Farm	ITM Easting 603159 ITM Northing 673998	Approximately 14.6 km	Operational	Jan-2006	3	V52/850
Ballincurry Wind Farm (Glengoole)	ITM Easting 625280 ITM Northing 651645	Approximately 14.7 km	Operational	2022/23	2	2.3 MW
Gurteen Lower ST	ITM Easting 627374 ITM Northing 653337	Approximately 15.3 km	Operational	Aug-2018	1	Single turbine
Graigaman ST	ITM Easting 227562 ITM Northing 153648	Approximately 16.4 km	Operational	2022	1	Single turbine 0.5 MW
Kill Hill Wind Farm	ITM Easting 614633 ITM Northing 643140	Approximately 16.5 km	Operational	Dec-2014	16	E82/2300
Upperchurch Wind Farm	ITM Northing 594703 ITM Easting 660533	Approximately 17.0 km	Under Construction	Pending	22	3.5 MW
Patrick Costello Wind Turbine (ST)	ITM Easting 596248 ITM Northing 656284	Approximately 17.1 km	Operational	2018	1	Single turbine 0.5 MW
Turraheen Upper (ST)	ITM Easting 596239 ITM Northing 656316	Approximately 17.4 km	Operational	2018	1	Single turbine
Turraheen Upper J. Burke	ITM Easting 595122 ITM Northing 656443	Approximately 18.4 km	Operational	2012/13	2	-
Ballinlough-Ikerrin Wind Farm	ITM Easting 599225 ITM Northing 675472	Approximately 18.4 km	Operational	Jan-2006	3	V52/850
Hollyford Wind Farm	ITM Easting 595285 ITM Northing 655052	Approximately 18.6 km	Operational	Jan-2014	3	SWT-3.0-101
Glenough Wind Farm	ITM Easting 595268 ITM Northing 655070	Approximately 18.6 km	Operational	2011-2013	14	N80/2500
Glencarbry Wind Farm	ITM Easting 592905 ITM Northing 651558	Approximately 19.0	Operational	Jul-2017	12	N100/3300(7) N90/2500(5)
Cappawhite B Wind Farm	ITM Easting 594059 ITM Northing 658887	Approximately 19.0	Operational	Jun-2018	4	V105/3450
An Cnoc Wind Farm	ITM Easting 631928 ITM Northing 655231	Approximately 19.0 km	Operational	Sep-2017	5	2.3 MW
Ballybay Wind Farm	ITM Easting 633243 ITM Northing 656850	Approximately 20.4 km	Operational	Aug-2017	6	E82/2350

Table 7-16: Existing and permitted solar farms in proximity to the Proposed Project

Note: Permitted/proposed PV solar panels for installation on existing buildings were not included in this ornithological assessment of cumulative effects, as any potential effects on birds were not considered to act cumulatively with the Proposed Project

Description	Address	Distance/ direction	Planning Decision Date	Area (ha)	Habitat notes	Ornithological considerations
Dew Valley Foods UnLtd. Co. TCC: 2260732	Holycross Road, Thurles Co. Tipperary	3.9 km Southwest	Permitted Date: Mar-2023	9.3 ha	Intensively managed farmland on the outskirts of town	No significant effects on birds
ENGIE Development (Ireland) Ltd TCC: 19601012 ABP 306933-20	Rahelty, Shanballyduff, Co. Tipperary	4.0 km East	Permitted Date: Apr-2021	38.3 ha	Some less improved grassland	No significant effects on birds - peregrine breeding within 500 m
Templederry Energy Resources Ltd TCC: 16600170	Moyneard, Moyne, Co. Tipperary	4.5 km East	Decision Date: Oct-2016	10.4 ha	Improved grassland/tillage	No significant effects on birds
ENGIE Development (Ireland) Ltd TCC: 19601159	Ballycarrane, outskirts of Thurles town, Co. Tipperary	4.9 km South	Permitted Date: Aug-2020	37.6 ha	Adjacent to River Suir – improved grassland, possible flooding occurs	No significant effects on birds
Elgin Energy Services Ltd TCC: 16600484	Lisnagonoge & Commons, Thurles, Co. Tipperary	5.1 km South-southwest	Permitted Date: Feb-2017	11.2 ha	Agricultural grasslands, with hedgerows & treelines – tributary of the Suir	No significant effects on birds
Soleirtricity Lisheen Ltd TCC: 211128	Cooleeny, Derryfada & Kooran (Lisheen Mine), Co. Tipperary	7.5 km East-northeast	Permitted Date: Mar-2022	77.0 ha	Former tallings ponds associated with historic mining - re-vegetated	No significant effects on birds
Power Capital Renewable Energy Ltd TCC: 2460156	Boscabell, Garranmore, Newark, Fussough, Dualla, Co. Tipperary	17.0 km South	Application Date: Mar-2024	129.0 ha	Improved agricultural grasslands tillage and smaller areas of woodland	No significant effects on birds
Soleire Renewables Spv Alpha 2 Ltd TCC: 19601323	Derrymore, Roscrea, Co Tipperary	20.0 km North	Permitted Date: Jan-2020	29.1 ha	GS1: dry calcareous & neutral grassland, improved grassland, scrub, bog	No significant effects on birds

7.5 Mitigation and Monitoring Measures

7.5.1 Mitigation Measures

7.5.1.1 Embedded mitigation

Embedded mitigation, or mitigation by design was implemented as part of the iterative design process, ensuring that areas of wetland habitat have been avoided by the Proposed Project. As detailed in Chapter 6, this includes areas associated with the River Suir floodplain that support FS1: reed and large sedge swamp, GM1: marsh habitats and PF2: poor fen and flush habitat, with land take within GS4: wet grassland, being minimised where possible. Avoiding these habitats minimises the potential for long-term effects on the areas of highest ecological value for wintering waterbirds, as well as range of grounding nesting species with unfavourable conservation status, including lapwing, snipe, meadow pipits and skylark.

As part of the iterative design process (mitigation by design), areas of older growth woodland have been avoided as much as possible within the requirements to maintain turbine-bat feature buffers and this habitat will be retained and enhanced over the life of the project. These areas were identified as important for woodland birds, including red listed species like breeding stock dove, and a range of amber listed breeding passerines, such as spotted flycatcher and goldcrest, as well as green listed species such as great spotted woodpeckers that have recently colonised the area, wintering woodcock and birds of prey, including breeding buzzard, sparrowhawk and long-eared owl.

Chapter 2: Description of the Project and Chapter 3 Civil Engineering of this EIAR provide details of the proposed mitigation measures that have been developed through the design of the proposed project (mitigation by design) to protect water resources. These are not repeated here, as measures to protect water quality are covered in the following sections.

The proposed grid connection route has been selected to utilise built infrastructure for the majority of its length, (i.e. cables to be laid within public roads). Avoiding the use of overhead electrical cabling for the grid connection limits potential avian collision risk. Cables will be laid underground to avoid effects on roadside hedgerows and disturbance to nesting birds.

Both the GCR and TDR have been designed to use the existing road network, and using existing infrastructure avoids direct effects to any sensitive habitat types and avoids unnecessary impacts on watercourses.

7.5.1.2 Construction Phase Mitigation

Protection of water quality

Mitigation measures proposed to protect water quality during construction are set out in the Construction Environmental Management Plan (CEMP) - see Appendix 2B. As measures in the CEMP will be fully implemented, this will avoid any adverse effects on birds relying on the maintenance in water quality in downstream aquatic habitats, including cormorant, grey heron, little egret, kingfisher and grey wagtail. The mitigation measures detailed within the CEMP are in accordance with the measures detailed in Chapter 6: Biodiversity (Section 6.5.1), Chapter 9: Water (Section 9.5.1) and the NIS (APEM, 2024), designed to protect water quality.

Avoidance of direct and indirect disturbance/displacement

Prior to commencement of works, including site investigation works, a due diligence ecological walkover survey of the proposed works corridor will be undertaken, including areas where vegetation removal is proposed along the grid connection route, TDR and to enable the implementation of turbine-bat feature buffers. To ensure any potentially sensitive ornithological receptors are identified in a timely fashion and allow for appropriate control

measures to be implemented, bird surveys will be undertaken within one month prior to the commencement of construction works, and walkovers will target all suitable habitats out to 500 m from the works corridor. Surveys will be undertaken by a suitably experienced ornithologist.

To avoid widespread disturbance to birds, access within the Proposed Project Site will be restricted to the footprint of the proposed works and for all construction activities no access between different parts of the site will be permitted except via the areas identified for proposed works, including for any site investigation works.

To avoid direct and indirect disturbance to breeding birds, the following restrictions on timings of construction works will be applied:

- Construction will be timed to commence outside of the bird breeding season (March to August inclusive). This does not preclude construction continuing during the breeding season, but would allow sensitive bird species to choose nesting sites away from sources of potential disturbance;
- Where removal of suitable nesting habitat is required to facilitate the works, habitat clearance works will be undertaken prior to the 1st of March in the construction year(s);
- Vegetation removal required for the creation of bat feature buffers around turbines will be undertaken outside of the bird breeding season;
- Once vegetation has been removed within the works area, these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase. Any areas of potential cover, particularly cover for ground nesting species, will be rendered unsuitable by cutting vegetation or tracking over with an excavator;
- Should the clearance of vegetation suitable for nesting birds be required during the bird breeding season, the relevant area(s) of vegetation will be surveyed in advance by the ECoW (with ornithological survey experience) to ensure no breeding birds / nests are present, or to apply appropriate buffer zones to ensure no potential for disturbance;
- Any construction works proposed during the breeding bird season will be preceded by a survey and will ensure the implementation of buffer zones (if nests/territories are identified) and measures required in order to avoid disturbance. Particular attention will be given to sensitive bird species (including breeding raptors and waders). Ongoing monthly site visits will be undertaken during the breeding season (mid-March to early-July, inclusive) to monitor for bird nesting activity and apply appropriate buffers. These will be undertaken weekly up until the end of April, and in any areas where construction is moving into new areas. Visits may be reduced to fortnightly or monthly after the end of April where no new areas are being moved into and the risk of new nesting behaviour within a potential disturbance distance is considered low. Any decision to reduce the monitoring period will be undertaken by the site ECoW (ornithologist) and rationale supported in the compliance reporting.
- Monitoring will target all suitable habitats out to 500 m from the works corridor for sensitive target species, including breeding waders and birds of prey, and particular attention will be paid to the area ahead of construction works. Surveys will be undertaken by a suitably experienced ornithologist;
- A pre-construction lapwing survey will be undertaken in late February/early March to monitor lapwing breeding sites (identified in Appendix 7G: Figure 7G.1), as this species may be present on territories early in the spring. Appropriate buffers will be implemented around any identified lapwing breeding sites and access for construction works restricted. Lapwing are considered relatively tolerant of disturbance (Cutts et al., 2009; Woodward et al., 2015; Mc Guinness et al. 2015; Goodship & Furness, 2019) and birds nesting in farmland habitats are habituated to a level of agricultural activity on the site. Therefore, taking account of on-site conditions, buffers of 100-200 m on lapwing breeding sites will be applicable. Buffers can be revised upwards or downwards based on professional judgement of the site ECoW (ornithologist), with consideration given to the behaviour of any pairs present and the nature of the works being undertaken. Typically the highest levels of sensitivity are in the early spring and are associated with egg laying and the period of incubation.
- The proposed borrow pit is within 500 m of the known peregrine nest site, and therefore lies within the minimum recommended breeding season buffer zone (Goodship & Furness, 2022). To avoid disturbance during the breeding season, works in the borrow pit will commence prior to the onset of the bird

breeding season, i.e. prior to the 1st of March. This will allow the resident pair to habituate to the disturbance factors or relocate to an alternative site, if necessary. It is unlikely that this pair will be significantly affected by the works given the secure position of the nest in relation to the works, as well as the separation distance (> 340 m) combined with a level of natural screening provided by woodland and slope, and the high tolerance of this species to certain construction related disturbance factors, e.g. works in quarries. As a precautionary measure, if the site is occupied, no works will be permitted to take place within 500 m of the peregrine nest during egg laying and early incubation, which are considered to be the most sensitive stages in the breeding season. Typically, this occurs between April and mid-May. In construction years, nest site monitoring will be undertaken by suitably experienced ornithologists in April to determine what stage the birds are at and to manage when restrictions are no longer required. Fledging success and dispersal will be surveyed to investigate how fledged birds disperse into the wider area in relation to the turbines being constructed. Observations over the baseline study suggests that young birds do not disperse towards the proposed turbines.

7.5.1.3 Operational Phase Mitigation

Protection of water quality

As detailed in Chapter 6: Biodiversity and Chapter 9: Water, the risk of deterioration in water quality during the operational phase of the project is lower than during the construction phase, due to the reduced levels of traffic on site. With the following measures in place, any adverse effects on birds that rely on good quality water in downstream aquatic habitats will be avoided, including cormorant, grey heron, little egret, kingfisher and grey wagtail.

The sediment ponds employed during construction will be partly filled on the completion of construction works in the interest of health and safety. These will continue to function along with other drainage infrastructure, in ensuring that runoff will be attenuated and dispersed across existing vegetation before reaching the downstream receiving waters. This infrastructure, along with culverts and stream crossings will be inspected regularly by the operational maintenance personnel and appropriately maintained over the lifetime of the Proposed Project.

All vehicular movement during operation and maintenance will be restricted to the internal access tracks and hardstands, i.e. no crossing of rivers or streams by machinery will be permitted. Any maintenance required will avoid hydrological features by the implementation of buffer zones (50 m to main watercourses, and 10 m to main drains, except for watercourse crossings), as stated in the construction phase mitigation. Any herbicides/weed killers will be ecologically safe products and will be safe for the aquatic environment. This will ensure that any run-off from the site will not contain harmful herbicides/weed killers that could affect surface water.

No fuels, oils or construction fluids will be stored on site, unless within a designated area with bunds of 110% storage capacity and away from any drains and/or watercourses. Any maintenance vehicles will also be checked for leaks and other potential sources of contaminants before arriving on site and on a daily basis for the maintenance time required. Spill kits will be available in areas where these chemicals are stored. No plant maintenance will be completed on-site and any broken-down plant must be removed from site to be fixed.

Potential effects on water quality due to the operation and maintenance of the wind farm is principally related to the minor risk of oil spillages. This risk is mitigated by design through the provision of adequate bunding and implemented in the construction stage.

Any maintenance works required during the operational phase will follow the mitigation measures outlined in Chapter 6, Chapter 9 and in the NIS.

Mitigation measures for collision risk and displacement effects

The potential impacts on birds during the operational phase of wind farm developments relate to the consequential effects on sensitive populations from mortality arising from turbine collisions and displacement

effects of operational turbines. The relative magnitude of effects due to displacement and collision as a result of operational wind turbines can be closely related. For instance, displacement effects on a population may limit collision risk. However this relationship is seldom likely to be absolute and the relationship between displacement and collision risk is more likely to be dynamic, evolving over time. For example, birds initially displaced by turbines can become increasingly habituated to them over time, which may correspondingly result in increased levels of collision risk, if the species is susceptible to collisions. This also highlights the importance of post-construction monitoring for wind farm projects.

Mitigation measures can be designed to exploit displacement effects as means of reducing collision risk, by making areas around turbines less suitable for sensitive species. While this approach may be appropriate to limit the attractiveness of the foraging habitats for certain species, displacement of sensitive species from breeding sites in particular, may in some cases be less desirable. The following sections provide mitigation measures to limit the effects of displacement and predicted collision risk for species where potential significant effects during the operational phase of the Proposed Project have been identified – see Section 7.4.5.

Mitigation measures for breeding lapwing

There were a maximum of 6 pairs of lapwing utilising the Proposed Project Site, which were assessed as a nationally important population (NRA, 2009). The baseline study identified two breeding areas, one located on the western bank of the River Suir, north of the Rossestown Bridge; and the other to the east, associated with a second order tributary of the River Suir – see Figure 7G.1 in Appendix 7G. The infrastructural footprint of the Proposed Project was designed to avoid lapwing breeding areas, and all turbines are set back at least 100 m.

For breeding lapwing, in the absence of mitigation, operational turbines at the Proposed Project Site where predicted to exert a low magnitude of effect (c. 1%) in realtion to collision risk and a low magnitude effect (1-5%) in relation to displacement. This is a precautionary assessment however, as evidence suggests that this species is notably tolerant of operational turbines (Cutts et al., 2009; Woodward et al., 2015; Mc Guinness et al. 2015; Goodship & Furness, 2019).

On-site habitat conditions were assessed during the baseline study as being sub-optimal for breeding lapwing. This population was struggling to breed successfully, mainly due to apparent predation effects. Management measures are proposed to improve the quality of the breeding habitat for lapwing, thus ensuring increased productivity and survival of young birds. The implementation of these measures are anticipated to offset the low magnitude effects due to predicted collision risk and displacement. If these measures can deliver the successful breeding attempted and survival of 1 to 2 lapwing annually, this would therefore completely offset any potential adverse effects as a result of predicted collision risk and displacement. Measures also aim to increase the size of the breeding population, as there is evidence that larger colonies are more successful.

The areas selected by breeding lapwing within the Proposed Project Site are large, open field compartments that support wet grasslands subject to period flooding, which provide a mosaic of nesting cover and open areas for foraging.

Required management measures for breeding lapwing are:

- Maintaining the open nature of the fields currently selected by lapwing, minimising scrub encroachment and maximising compartment size without impacting on connectivity for other species, such as bats.
- Removing or cutting back any prominent trees, shrubs or features acting as perches for avian predators, such as hooded crows and buzzards.
- Implementing a program of predator control focusing on hooded crows, mink and foxes.
-
- Extensive cattle grazing over the late summer and autumn will be employed to ensure that rank swards do not dominate vegetation cover. Autumn mowing of wet grassland will be undertaken when required.

- These measures will be implemented in the breeding season prior to construction and will be ongoing for the lifetime of the Proposed Project.
- The condition of the fields utilised by breeding lapwing will be monitored in Year 1, 2, 3, 5, 10 and 15 post-construction to assess continued suitability for breeding lapwing. Monitoring will also record the number of territories, approximate locations of nest and breeding success, as well as any negative factors that may potentially limit breeding success.

Mitigation measures for breeding snipe

It is estimated that the Proposed Project Site supports up to five snipe territories, which were assessed as a population of county importance (NRA, 2009). Breeding was associated with very distinct areas holding wetland habitats, with three breeding areas identified with the 500 m proposed turbine buffer. However, only two of these area are within the Proposed Project Site. This includes the wetland adjacent to T2 on the west bank of River Suir and a field of wet grassland between T7 and T5, east of River Suir – see Figure 7G.1 Appendix 7G. Mitigation by design has ensured that core snipe breeding areas are largely avoided by the proposed infrastructure, which will minimise any direct effects during construction and ensures that suitable wetland habitats are retained over the operational phase.

For breeding snipe, in the absence of mitigation, operational turbines at the Proposed Project Site were assessed as having the potential to induce a low magnitude effect (1-5%) in relation to displacement. Breeding season flights were under recorded, however a corrected collision risk model predicted that collision risk (as corrected) has the potential to exert a low magnitude of effect (1-5%) on breeding snipe. Based on Percival et al. (2009), displacement effects are the main consideration for breeding snipe with densities within 400 m of operational turbines declining by nearly 50%, thus equating to a potential displacement effect of 2-3 territories within the Proposed Project Site.

Management measures are proposed to improve the quality of the breeding habitat for snipe to maintain baseline breeding densities and potentially increase the number of territories over the lifetime of the Proposed Project. Implementing these measures will offset the low magnitude effects due to predicted displacement. These measures will aim to maintain baseline breeding densities, i.e. five territories with the Proposed Project Site, and would offset any potential adverse effects due to displacement effects.

The areas selected by breeding snipe within the Proposed Project Site are within the large, open field compartments supporting a mosaic of swampy, marshy and fen-type habitats (FS1, GM1, PF2) within areas dominated by wet grasslands (GS4) subject to periodic flooding. Optimal breeding snipe habitats include areas of soft damp ground, with a tussocky sward and large open fields not surrounded by trees.

Required management measures for breeding snipe are:

- Maintaining the proportion of marshy grassland and fen/flush habitats within the wetter area of the Proposed Project Site currently selected by breeding snipe.
- Maintaining the open nature of the fields currently selected by snipe, minimising scrub encroachment and maximising compartment size without impacting on connectivity for other species, such as bats.
- Extensive cattle grazing over the late summer and autumn months will be employed to ensure that rank swards do not dominate vegetation cover. Autumn mowing of wet grassland will be undertaken when required.
- Removing or cutting back any prominent trees, shrubs or features acting as perches for avian predators such as hooded crows and buzzards.
- The predator control proposed in order to improve lapwing breeding success will also benefit snipe productivity.
-
- These measures will be implemented in the breeding season prior to construction and will be ongoing for the lifetime of the Proposed Project.

- The condition of the areas utilised by breeding snipe will be monitored in post-construction Years 1, 2, 3, 5, 10 and 15 to assess continued suitability for breeding snipe. Monitoring will also record the number of territories and approximate locations of nests, as well as any negative factors that may potentially limit breeding success.

Mitigation measures for wintering waterbirds

The River Suir floodplain north of Rossestown Bridge was identified as periodically supporting regionally important flocks of wintering waterbirds, in particular lapwing and golden plover. This area is covered as part of the IWeBS site: River Suir Upper - Brittas [0J302 - 0J397]. Peaks in activity were linked to seasonal flooding of the river, and the Proposed Project Site was utilised in conjunction with other locations in the wider area. Hunting of wildfowl over the open season (September to January inclusive) was one of the main factors limiting bird usage of the area. This activity results in significant levels of disturbance, leading to increasing flushing and flight activity, which has subsequent displacement effects on wintering waterbirds and the potential to affects levels of predicted collision risk.

The baseline study predicted a collision risk of low significance (Percival 2003) for wintering lapwing (1-5% effect at 0.995 avoidance rate), golden plover (1-5% effect at 0.995 avoidance rate), lesser black-backed gulls (1-5% effect at 0.995 avoidance rate) and snipe (1-5% effect, based on corrected hypothetical CRM). Potential for displacement effects of low significance (Percival 2003) was identified for wintering lapwing (6-20% effect, precautionary assessment) and golden plover (6-20% effect, precautionary assessment). In addition, potential for cumulative displacement effects on lapwing were identified in combination with mitigation measures for Borrisbeg Wind Farm, where habitat management measures will be implemented to displace wintering flocks of lapwing of a similar size to those at Brittas. Given the separation distance between sites (c. 12.8 km), it is likely that wintering lapwing utilise both locations.

At Brittas, the positioning of proposed turbines avoids areas prone to flooding and the associate wetlands and open grassland habitats, which are the features attracting wintering waterbirds to the area. It is anticipated that operational turbines will initially exert a slight displacement effect on flocks of golden plover and lapwing, as well as other waterbirds utilising the area. However, overtime (maximum 2-3 years post-construction) this effect will dissipate, as birds habituate to the operational turbines, and usage of the area will return to the periodic winter usage recorded over the baseline study period. Habituation then introduces the potential for increased collision risk. The case is made that, in reality, golden plover and lapwing exhibit notably high levels of turbine avoidance, with some authorities suggesting that avoidance as high as 99.9% may be applicable for populations of wintering birds. However, as NatureScot are yet to adopt the recommended alterations to avoidance rate, there remains a level of uncertainty in applying the outputs for collision models using higher rates, as is the case in the ornithological assessment for the Proposed Project.

Required measures for wintering waterbirds are:

- As already incorporated into the design of the turbine layout for the Proposed Project has been configured (embedded mitigation), so as to facilitate continued utilisation the River Suir floodplain by winter waterbirds, in particular the area within the IWeBS site: River Suir Upper - Brittas [0J302 - 0J397].
- Disturbance of wintering waterbirds within the Proposed Project Site will be minimised by restricting the hunting of wildfowl, particularly the area within the northern half of the IWeBS site: River Suir Upper - Brittas [0J302 - 0J397], where a no take zone will be implemented.
- No habitat management measures are required, as the wintering waterbird assemblage is attracted to the area due to flooding events. Measures required during the breeding season for breeding waders will be beneficial to wintering waterbirds, including maintaining the open nature of the fields along the River Suir, north of the Rososestown Bridge, by minimising scrub encroachment and maximising compartment size. If landowners are amenable, additional enhancement measures for wintering waterbirds can be implemented, such as wader scrapes. However, these measures are not required for mitigation.

- Due to potential habituation and change in use of the area by species such as lapwing and golden plover, monitoring will be required over the winter period. As detailed in Section 7.5.2.2, this will include monitoring of bird usage over the winter, and searches of selected turbines for bird strike. The habitat condition of the areas within the I-WeBS site: River Suir Upper - Brittas [0J302 - 0J397] will be monitored in post-construction Years 1, 2 , 3, 5 10 and 15 to assess continued suitability for wintering waterbirds, including any negative factors potentially limiting bird usage.

Mitigation measures for kestrel

Breeding raptor surveys identified two kestrel breeding territories within the 2 km proposed turbine buffer, with no nest sites located within the 500 m proposed turbine buffer – see Appendix 7G: Figure 7G.4. After buzzard, kestrel was the most active raptor species within the Proposed Project Site. Based on kestrels apparently exhibiting a high level of tolerance to operational turbines, any disturbance and/or displacement effects are unlikely, and thus collision risk is the main consideration for this species. The baseline study predicted collision risk of low significance (Percival 2003) for local kestrel population (6-20% effect at 0.95 avoidance rate).

Required measures for kestrel are:

- The provision of nest boxes as a compensatory measure to increase productivity in the area and offset the potential negative effects due to predicted collision risk during the operational phase of the Proposed Project. This type of enhancement measure is considered appropriate for kestrels, as this species often struggles with inter-species nest site competition, e.g. with buzzards. Provision of nest boxes at selected sites around the periphery of the Proposed Project Site will provide this species with more nesting options in the area. Initially, five nest boxes will be erected in suitable locations, prior to construction, as directed by a suitably experienced ornithologist. Depending on the up take of these site, further nest boxes will be provided over the operational life of the Proposed Project.
- Nest box specification and installation will be in line with the requirements detailed by ACRES (2024)[57].
- Nest boxes will be monitored in post-construction Years 1, 2 3, 5, 10 and 15 to record species occupation and breeding success if utilised by breeding kestrel. Note: This measure may also result in occupation of nest boxes by barn owls and long-eared owls, which are known to breed in the wider area. This would have a positive effect on local birds of prey populations.
- For kestrels, an important consideration will be the ground conditions remaining following the removal of vegetation around turbines to create turbine-bat feature buffers, as any remaining brash or debris may promote the occurrence of rodent populations that will attract foraging kestrels in close proximity to turbines, thus increasing collision risk. Therefore, all felled timber and brashed material will be removed, and any remaining tree stumps will be chipped down to ground level. Finely chipped wood and spoil will, as necessary, be broadcast to create a flat surface for re-seeding; and any open field/forestry drains will be piped and filled over. The aim of these actions is to limit prey availability around turbines by creating a uniformly short/cropped vegetation structure maintained through grazing/mowing that will support fewer prey items (rodents/birds) for foraging kestrels. Importantly, these measures are consistent with maintaining an open area around turbines in order to discourage bats from foraging in/commuting through the collision risk zone.

Mitigation measure for peregrine

A pair of peregrine breed within 600 m of the closest turbine. No displacement effects are anticipated. Predicted collision risk has the potential for a low magnitude of effect (1-5%) on the local breeding population. In the context of a stable or expanding national peregrine population, any additional turbine mediated mortality will have an imperceptible impact (< 1%) on the regional peregrine population, which will recruit into the local area and replace any birds occasionally lost to turbine mediated mortality. Adult peregrines are anticipated to exhibit high levels of turbine avoidance. However, the proximity of the nest to the proposed turbines does introduce a level

[57] ACRES (2024). *Agri-Climate Rural Environment Scheme (ACRES). Co-operation Non-Productive Investments Specification*. Version 2.0 September 2024. Department of Agriculture & the Marine.

of uncertainty over collision risk to recently fledged birds, especially if dispersal flight behaviour varies from that observed over the baseline, which did not appear to result in increased flight activity of fledged birds around the proposed turbine locations.

Proposed measures for peregrine include:

- The employment of post-construction monitoring (Years 1, 2, 3, 5, 10 and 15) around fledging time to monitor peregrine chicks fledge and to ensure that they disperse safely. The monitoring protocol is detailed in Section 7.5.2.

Mitigation measures for swift

The Proposed Project Site is within the breeding season foraging range of swift breeding sites in surrounding towns and villages, and periodically supports foraging birds of county importance (> 5 birds). CRMs run on assumed levels of flight time within the CRZ indicate that there is potential for moderate (6-20%) population levels effects on the regional swift population.

Required measures for swift are:

- The provision of swift nest boxes as a compensatory measure to increase productivity in the region and offset the potential negative effects due to predicted collision risk during the operational phase of the Proposed Project. As there is no suitable swift nesting habitat within the Proposed Project Site, financial support will be provided to Swift Conservation Ireland[58] that will be targeted at increasing swift number in the surrounding towns and villages through the implementation of nest box schemes on suitable buildings. This will cover the cost of installing 10 swift nest compartments at one or several optimal locations and will include the use of attraction calls. Nest boxes will remain in place throughout the lifespan of the Proposed Project.

7.5.2 Monitoring Measures

SNH (2009)[59] provides guidance on post-construction monitoring requirements for onshore wind farms.

All surveys monitoring birds will be undertaken by an appropriately experienced ornithologist.

7.5.2.1 Construction phase ornithological monitoring

SNH (2009) states the following in relation to ornithological monitoring during the construction of onshore wind farms:

Monitoring should also take place during construction, where these effects are likely to be more than temporary, for example where disturbance and habitat loss (before mitigation) may have longer term impacts. Temporary effects are different in nature to those during the operation of the wind farm, and as they are not strictly part of the monitoring protocol, they are best dealt with through compliance monitoring of planning conditions.

Construction phase monitoring will involve the following actions:

- Bird surveys, as part of a pre-construction due-diligence ecological survey will be undertaken within one month prior to commencement of construction works and walkovers will target all suitable habitats out to 500 m from the turbine layout and works corridor.
- Should the clearance of vegetation suitable for nesting birds be required during the bird breeding season, the relevant area(s) of vegetation will be surveyed in advance by the ECoW (with suitable ornithological survey experience) to ensure no breeding birds / nests are present, or to apply appropriate buffer zones to ensure no potential for disturbance.

[58] Swift Conservation Ireland: https://www.swiftconservation.ie/nest-box-advice/
[59] SNH (2009). *Guidance note: Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms*. January 2009. Scottish Natural Heritage, now NatureScot

- Any construction works proposed during the breeding bird season will be preceded by a survey and will ensure the implementation of appropriate buffer zones, if nests/territories are identified and measures are required in order to avoid disturbance. Particular attention will be given to sensitive bird species, including breeding raptors and waders. Ongoing monthly site visits will be undertaken during the breeding season (mid-March to early-July, inclusive) to monitor for bird nesting activity and apply appropriate buffers. These will be undertaken weekly up until the end of April, and in any areas where construction is moving into new areas. Visits may be reduced to fortnightly or monthly after the end of April where no new areas are being moved into and the risk of new nesting behaviour within a potential disturbance distance is considered low. Any decision to reduce the monitoring period will be undertaken by the site ECoW (ornithologist) and rationale supported in the compliance reporting.
- Monitoring will target all suitable habitats out to 500 m from the works corridor for sensitive target species, including breeding waders and birds or prey, and particular attention will be paid to the area ahead of construction works. Surveys will be undertaken by a suitably experienced ornithologist
- A pre-construction visit will be required to monitor potential lapwing breeding sites identified in Appendix 7G: Figure 7G.1, as this species can be present on territories early in the season (late-February/early March). Appropriate buffers will be implemented around the any identified lapwing breeding sites and access for construction works restricted.
- The peregrine nest will be monitored throughout the breeding season while construction works are occurring in the southern part of the Proposed Project Site. Nest site monitoring will commence in April in order to determine what stage the birds are at and to identify when restrictions are no longer required. Fledging success and dispersal will be surveyed to investigate how fledged birds disperse into the wider area in relation to the turbines being constructed.

7.5.2.2 Operational phase ornithological monitoring

As mitigation measures are proposed to offset likely significant long-term effects on species such as kestrel and swift, post-construction monitoring is required in order to test the efficacy of these measures. Some monitoring is precautionary, targeting sensitive periods in the life cycles of species like peregrine, such as the dispersal of young recently fledged birds. In addition, varying levels of site utilisation annually, habituation and of potential cumulative displacement effects from other sites, in particular for lapwing and golden plover, require post-construction monitoring.

Ornithological monitoring surveys will start prior to the commencement of construction and, as per SNH (2009) guidance, will continue post-construction in Years 1, 2, 3, 4, 5, 10 and 15. Start dates for monitoring years should be in line with either the start of the breeding season or non-breeding season; and it is acceptable for the post-construction monitoring Year 1 to commence prior to the final close-out of construction, so long as the turbines are erected and turning, i.e. posing a collision risk.

Surveys will be conducted, in accordance with SNH (2009, 2017) guidance, by suitably experienced ornithologists and will include the following:

- Vantage point watches targeting:
  a) the peregrine nest site and T10 (re-locate VP1 to south of Brittas Castle);
  b) the IWeBS site: River Suir Upper from the Rossestown Bridge (VP4);
  c) the northwestern part of the 500 m turbine buffer, including Clonamuckoge Beg/Killkillahara from the bridge over the railway line (re-locate VP3 to bridge over railway); and,
  d) the northeastern part of the 500 m turbine buffer (VP2).
  Note: The positions of VP1 and VP3 will be re-located to provide optimal coverage of the 500 m turbine buffer.
- Wider area wintering waterbird surveys covering suitable habitat in the 500 m turbine buffer twice per month and an area extending out to 2-3 km once per month, which will target counts at waterbird sites identified during the baseline surveys. Monitoring will incorporate habitat condition an assessments of areas within the I-WeBS site: River Suir Upper - Brittas [0J302 - 0J397].

- Breeding season surveys of the 500m turbine buffer for breeding waders – snipe and lapwing. Monitoring will incorporate a habitat condition assessment of areas utilised by breeding waders.
- Breeding season monitoring of peregrine nest, including dispersal of young.
- Wider area breeding raptors surveys covering 2 km turbine buffer to monitor potential displacement effects on breeding kestrels. This will also record the occurrence of other breeding birds of prey, including barn owl (1 km buffer) and long-eared owl (500 m buffer).
- Monitoring of kestrel nest boxes.
- Monitoring of bird strikes (to be conducted in conjunction with bat fatality monitoring).

After Year 3 post-construction monitoring, the results will be reviewed, and survey requirements and mitigation will be altered accordingly based on the findings.

Further details of ornithological monitoring requirements are detailed in the following sections.

Vantage Point watches

For each VP, 36 hours of watches will be conducted in each season, i.e. a total of 72 hours per VP per monitoring year, split as follows:

- 36 hours per VP during the breeding season
- 36 hours per VP during the non-breeding season

Flight data will be collected for specified target species and will include the following: species, number, time of detection, flight height, mapped flight path and duration of flight. In addition, flight behaviour in relation to turbines and the wind farm envelope will be recorded following, for example, categories employed in Meredith et al. (2002)[60]. In summary, primary target species will include:

- Any species listed on Annex I of the Birds Directive
- All waterbird species
- All birds of prey
- Any species deemed to be at risk of collision or displacement listed as Red or Amber on the Birds of Conservation in Ireland (BoCCI), including swift, stock dove.

A list of all species encountered within the environs of the development area will also be compiled during vantage point watches.

Wider area wintering waterbird surveys

- Counts of wintering waterbirds, including location, behaviour and habitat use.
- Surveys covering suitable habitat within the 500 m turbine buffer will be undertaken twice per month; one these will be incorporated with surveys of the larger area.
- Surveys covering an area extending out to 2-3 km will be undertaken once per month, which will target counts at waterbird sites identified during the baseline surveys, as well as the Proposed Project Site.
- Monitoring will incorporate a habitat condition assessment of areas within the I-WeBS site: River Suir Upper - Brittas [0J302 - 0J397], including any disturbance factors.

Breeding wader surveys

- Breeding season surveys of the 500 m turbine buffer for breeding waders – snipe and lapwing.
- Surveys to record displaying/territorial snipe (drumming/chipping birds) will employ methodologies detailed in O'Brien & Smith (1992), incorporating pre-dawn/dusk visits targeting the known snipe breeding sites and other wetter areas capable of supporting snipe. A minimum of three visits at least 10 days apart will be undertaken from mid-April onwards, up until mid-June. Surveying can extend over a period of, either 3 hours after first light (dawn) or 3 hours before last light (dusk). To optimise the chance of registering drumming or chipping activity surveyors should aim to stay in areas of suitable habitat for

[60] As summarised in Appendix 1 of SNH (2009) or refer to Meredith, C., Venosta, M. & Resson, R. (2002). *Codrington Wind Farm avian avoidance behaviour report*. Biosis Research Report on project no. 2704, Melbourne, Victoria, Australia.

as long as possible, with a suggested minimum of 20 minutes. Days with light wind conditions (< 19 km/hr, 5.5 m/s, Force 3) should be selected for surveying. Drizzle or light rain is acceptable during surveys, as these can result in increased display activity. The application of thermal imagery cameras mounted to drones can be investigated as a complementary methodology to provide greater accuracy on nesting locations and numbers.

- Lapwing surveys will employ the methodologies detailed in O'Brien & Smith (1992). Three visits will be undertaken to locate the territories and then monitor breeding success. Care will be taken not to disturb incubating birds, and surveyors will maintain appropriate standoffs.
- Monitoring will incorporate a habitat condition assessment of areas utilised by breeding waders, including any disturbance factors.

Peregrine monitoring

- Breeding season monitoring of the peregrine nest to ensure the safe dispersal of young, involves intensive, sometimes full day (18 hour), tracking of birds over the fledging period.
- Early season visits will confirm occupancy of the nest and provide an estimate of fledging dates.
- Based on estimated fledging dates, surveyors will commence intensive nest site monitoring, with adjustments to the duration of watches implemented based on observed behaviours. Monitoring may not be required on days with low wind speeds, as turbines do not pose a collision risk. The ornithologist will work closely with the operational control team to devise monitoring schedules based on predicted operating conditions.
- Monitoring of fledged young will continue until the juveniles are judged to be proficient at flying, so as to avoid collisions and/or until they have dispersed away from the natal site. Over this period, turbine searches are also undertaken, and these are implemented, as soon as the fledglings start flying away from the nest site – see section on monitor bird strike.
- After three years of monitoring, if it can be demonstrated that the dispersal patterns of fledgling peregrines do not lead inexperienced birds towards the turbines, then ongoing annual monitoring will not be required and monitoring years, as per SNH (2009) will apply, i.e. monitoring in post-construction Years 5, 10 and 15.

Wider area breeding raptors and owl surveys

- A combination of 'mini-VPs', as well as driven and walked transects will be employed to survey potential nesting habitats for breeding raptors within the 2 km turbine buffer.
- Clear days in early spring will be targeted to survey for displaying/soaring/territorial birds of prey. Depending on the species, these possible breeding sites will be investigated further in order to determine occupancy. The main target species is kestrel.
- The known barn owl site to the northwest of the proposed development site will be monitored for occupancy.
- Dusk surveys covering the woodland area in the southern part of the Proposed Development Site will be employed in spring and late summer to survey for the presence of long-eared owl.

Monitoring bird strike

Turbine searches will be undertaken to detect any fatalities (and possibly injured animals) due to turbine collision. Currently, there are no standardised methodologies for the monitoring of wind farm collisions in Ireland and as such the following protocol should be modified as and when guidelines are established.

- The extents of search areas around turbines are justified based on findings from previous studies, with the frequency and timings of searches designed to target the species identified as being at risk of colliding with turbines.
- Monitoring should commence once turbines are erected with blades turning, and will target the following turbines over the following periods:
    - Wintering waterbirds: T01, T02, T03, T07, T08 - a total of six rounds of searches, October to March (April if birds regularly occur on passage) approximately a 20 days apart. Frequency of rounds can be altered if the area becomes particularly busy with bird activity.

  - Breeding waders: T2, T3, T5, T7 - a total of 4 rounds of searches targeting early spring (March) for lapwing display period and April/May for snipe display period.
  - Peregrine: T10, with the selection of additional turbines to be informed through monitoring of dispersal - intensive searches will be employed for approximately two week period covering peregrine fledging and dispersal - commencing once fledglings are on the wing and until they are judged to be proficient at flying, so as to avoid collisions.
- A minimum search area of 50 m around each turbine will be searched by specifically trained teams of dogs and handlers. Well-selected dogs, trained by an experienced professional should be employed. Trained wildlife detection dogs have been shown to be significantly more effective than humans in detecting fatalities from collision. Dogs will not be over worked and will be rested appropriately between and during searches.
- During turbine searches any remains of animals (birds and bats) will be recorded and the following information collected:
  - Detailed photographs of remains in situ.
  - Description of remains, including: species identification, age and sex, (where possible), carcass condition (where possible), including notes on evidence of scavenging, estimated age of remains and any evidence of trauma, suspected cause of death, (if possible, often not clear), turbine number and distance/bearing from turbine, GPS coordinates of the carcass location.
- Searcher efficiency trials: A trial to provide an indicative measurement of searcher efficiency will be undertaken during each round of searches.
- Carcass persistence trails: An estimate for scavenging rates across the wind farm site will be established by employing time/date stamped motion sensitive cameras (trip cams) baited with a range of carcass types. This will determine what scavengers are active on the site and how long baits remain in situ.

7.6 Residual Impacts and Effects

Residual effects are those which are likely to occur even following the implementation of mitigation measures. Table 7-17 provides an overview of likely significant effects for important ecological features, summaries proposed mitigation measures required to control against the significant effects identified and then lists any residual effects which may occur following the implementation of mitigation measures. Section 7.4.3 and Section 7.4.5 provide summaries of effects, in the absence of mitigation, for the construction phase and operational phase of the Proposed Project, respectively. Likely significant effects were identified due to unmitigated:

- Deterioration in water quality, during both construction and operation
- Construction related direct/indirect disturbance
- Operational collision risk
- Operational disturbance/displacement

For these impacts the following the sections list the IEF affected, the level of unmitigated effects and gives a summary of mitigation measure.

Impact: Deterioration in water quality, during both construction and operation

Species affected and unmitigated effects:

- Riverine birds, with specific effects of medium significance on kingfisher, low significance on little egret, and cormorant and of very low significance on grey heron and imperceptible effects on grey wagtail.

Mitigation

An assessment of mitigation measures to protect water quality is laid out in Section 7.5.1.2 (construction) and Section 7.5.1.3 (operational), with reference to the application of best practice as presented in the CEMP (Appendix 2B) for the Proposed Project, and mirroring the mitigation measures proposed by the NIS (APEM, 2024), EIAR Chapter 6: Biodiversity and EIAR Chapter 9: Water.

Impact: Construction related direct/indirect disturbance

Species affected and unmitigated effects:

- Breeding assemblage of birds, with specific effects of low significance on local breeding populations of lapwing, snipe, peregrine, kestrel, barn owl and of very low significance for green listed birds of prey, including sparrowhawk, buzzard and long-eared owl, other non-passerines including stock dove and imperceptible effects for a range of red/amber listed breeding passerine, especially for those nesting in woodland/scrub.
- Wintering waterbirds with specific effects of low significance on lapwing, golden plover, snipe and very low significance for jack snipe.

Mitigation

Mitigation measures proposed to avoid direct and indirect disturbance/displacement to the assemblage of breeding birds utilising the Proposed Project Site are provided in Section 7.5.1.2, which following best practice guidelines for construction. No mitigation is required to limit disturbance to wintering waterbirds, as disturbance/displacement effects are short-term and reversible - these bird populations are not wholly reliant on the Proposed Project Site for survival and if displaced at all, baseline populations are predicted to return to the area soon after construction is completed.

Impact: Operational collision risk

Species affected and unmitigated effects:

- Breeding waders including effects of low significance for lapwing and snipe.
- Wintering waterbirds including effects of low significance on for lapwing, golden plover, snipe and lesser black-backed gull.
- Birds of prey including effects of low significance for kestrel and peregrine and very low significance for buzzard.

Mitigation

Proposed mitigation for predicted collision risk and displacement effects are considered together in Section 7.5.1.3, with species specific mitigation strategies provided employing a combination of avoidance, e.g. important wetland habitats, offsetting with enhancement measures, e.g. provision of nest boxes to increase productivity and monitoring during sensitive periods, e.g. at fledging time for peregrine.

Impact: Operational disturbance/displacement

Species affected and unmitigated effects:

- Breeding waders including effects of low significance for lapwing and snipe.
- Winter waterbirds including effects of low significance for lapwing and golden plover.
- Birds of prey including effect of very low significance for long-eared owl.

Mitigation

Proposed mitigation for predicted collision risk and displacement effects are considered together in Section 7.5.1.3, with species specific mitigation strategies provided employing a combination of avoidance, e.g. important wetland habitats, offsetting with enhancement measures, e.g. provision of nest boxes to increase productivity and monitoring during sensitive periods, e.g. at fledging time for peregrine.

The mitigation measures proposed in Section 7.5.1, combined with ornithological monitoring detailed in Section 7.5.2, provide robust and effective protection to avian important ecological features likely to be affected by the Proposed Project in the absence of mitigation. As set out in Table 7-17 any residual effects are outlined after taking account of the mitigation proposed. For the likely significant effects assessed, application of the proposed mitigation measures in full will limit residual effects to negligible/not significant (Percival, 2003) or imperceptible (EPA, 2022).

The exceptions being disturbance/displacement effects to wintering waterbirds over construction ONLY and specifically to wintering lapwing, wintering golden plover and wintering snipe, where residual effects of low significance (Percival, 2003) remain. Any residual displacement effects on wintering waterbirds during

construction are short-term, limited to the period of construction (unlikely to extend beyond one winter) and are reversible (EPA, 2022), and birds will return to the area post-construction.

7.6.1 Statement of Significance

In considering the residual effects, i.e. those with mitigation in place, and assuming that the mitigation measures referred to in this chapter are adopted in full, there are not likely to be any residual significant effects on avian important ecological features, beyond those on wintering waterbird population (lapwing, golden plover and snipe) of low significance due potential disturbance/displacement during construction, which are short-term and reversible.

Table 7-17: Summary of residual impacts on avian IEF with proposed mitigation measures

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
Lapwing - breeding 6 pairs Nationally important (NRA, 2009) High sensitivity (Percival, 2003)	Construction	See Section 7.4.2.2 Disturbance/ displacement	Short-term Low (1-5%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2)	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a high sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a nationally important population (NRA, 2009) – any slight/imperceptible (EPA, 2022) effects are reversible
	Operational	See Section 7.4.4.2 Disturbance/ displacement	Long-term Low (1-5%)	Low significance	Embedded mitigation - avoidance of breeding habitats (Section 7.5.1.1) Habitat enhancement (Section 7.5.1.3)	Accounting for potential cumulative effects (Section 7.4.7.3), with mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a high sensitivity receptor, resulting in a negative effect that is **not significant** (Percival, 2003) over the long-term (EPA, 2022) on a nationally important population (NRA, 2009)
		Predicted collision risk 0.03 collisions/year (99.5% avoidance)	Long-term Low (1-5%)	Low significance	Strong evidence from post-construction studies that turbine mediated fatalities are exceptional low (Percival et al. 2009, 2018a, 2018b) – avoidance of 99.99% may be applicable	Based on evidence from post-construction monitoring risk of collision is lower than predicted by CRMs and therefore magnitude of effect is downgraded to negligible (< 1%) on a high sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the long-term (EPA, 2022) on a nationally important population (NRA, 2009)
Lapwing - wintering 10-200 birds (up to 500 birds) Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.2 Disturbance/ displacement	Short-term Mod. (6-20%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) No mitigation proposed	Unchanged – highly precautionary assessment moderate magnitude (6-20%) effect on a medium sensitivity receptor results in a negative effect of **low significance** on a regionally important population (NRA, 2009), over the short-term (EPA, 2022) - effects are reversible (EPA, 2022), i.e. birds will return post-construction
	Operational	See Section 7.4.4.2 Disturbance/ displacement	Long-term Mod. (6-20%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) Habitat enhancement & control hunting on-site (Section 7.5.1.3)	Accounting for potential cumulative effects (Section 7.4.7.3), with mitigation in place, a level of short-term (EPA. 2022) displacement is anticipated, which over the long-term (EPA, 2022) will have a negligible (< 1%) magnitude

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
						effect on a medium sensitivity receptor resulting is a negative effect that is **not significant** (Percival, 2003) on a regionally important population (NRA, 2009)
		Predicted collision risk 2.51 collisions/year (99.5% avoidance) – see Table 7-9	Long-term Low (1-5%)	Low significance	Strong evidence from post-construction studies that turbine mediated fatalities are exceptional low (Percival et al. 2009, 2018a, 2018b) – avoidance of 99.99% may be applicable	Based on evidence from post-construction monitoring risk of collision is anticipated to be lower than predicted by precautionary CRMs and therefore magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003), over the long-term (EPA, 2022) on a regionally important population (NRA, 2009)
Golden plover – wintering 10-200 birds (up to 700 birds0 Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.3 Disturbance/ displacement	Short-term Mod (6-20%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) No mitigation proposed	Unchanged – highly precautionary assessment moderate magnitude (6-20%) effect on a medium sensitivity receptor results in a negative effect of **low significance** on a regionally important population (NRA, 2009), over the short-term (EPA, 2022) - effects are reversible (EPA, 2022), i.e. birds will return post-construction
	Operational	See Section 7.4.4.3 Disturbance/ displacement	Long term Mod. (6-20%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) Habitat enhancement & control hunting on-site (Section 7.5.1.3)	Accounting for potential cumulative effects (Section 7.4.7.3), with mitigation in place, a level of short-term (EPA. 2022) displacement is anticipated, which over the long-term (EPA, 2022) will have a negligible (< 1%) magnitude effect on a medium sensitivity receptor resulting is a negative effect that is **not significant** (Percival, 2003) on a regionally important population (NRA, 2009)
		Predicted collision risk 4.28 collisions/year (99.5% avoidance) – see Table 7-9	Long-term Low (1-5%) to Mod. (6-20%)	Low significance	Strong evidence from post-construction studies that turbine mediated fatalities are exceptional low (Percival et al. 2009, 2018a, 2018b) – avoidance of 99.99% may be applicable	Based on evidence from post-construction monitoring risk of collision is anticipated to be lower than predicted by precautionary CRMs and therefore magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003), over the long-term (EPA, 2022) on a regionally important population (NRA, 2009)

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
Snipe – breeding Up to 5 territories in Site Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.4 Disturbance/ displacement	Short-term Low (1-5%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2)	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a regional important population (NRA, 2009) – any slight/imperceptible (EPA, 2022) effects are reversible
	Operational	See Section 7.4.4.4 Disturbance/ displacement	Long-term Low (1-5%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) Habitat enhancement & control hunting on-site (Section 7.5.1.3	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor, resulting in a negative effect that is **not significant** (Percival, 2003) over the long-term (EPA, 2022) on a regionally important population (NRA, 2009)
Snipe – wintering Flush count max. 36 birds Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.4 Disturbance/ displacement	Short-term Mod. (6-20%)	Low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) No mitigation proposed	Unchanged – highly precautionary assessment moderate magnitude (6-20%) effect on a medium sensitivity receptor results in a negative effect of **low significance** on a regionally important population (NRA, 2009), over the short-term (EPA, 2022) - effects are reversible (EPA, 2022), i.e. birds will return post-construction
	Operational	See Section 7.4.4.4 Disturbance/ displacement	Long term Negl. (< 1%)	Not significance	Very localised displacement effects - unlikely to extend > 80-100 m from the turbine base.	Unchanged – **not significant**, slight positive effect anticipated due to habitat management/control of shooting implemented as mitigation for other species
Snipe – breeding & wintering 5 territories/max. win count 36 Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Operational	Predicted collision risk 0.01 collisions/year (98% avoidance) – see Table 7-9 Correcting for under recording of flight activity indicates potential for low magnitude effect	Long-term Low (1-5%)	Low significance	Based on evidence from reviews (e.g. Hötker et al, 2006, Dürr, 2023) the level of turbine mediated mortality anticipated for snipe is low	Based on literature review, risk of collision is anticipated to be low therefore magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003), over the long-term (EPA, 2022) on a regionally important population (NRA, 2009)
Lesser black-backed gull Not breeding: 1-37 birds (max. 70) Regionally important (NRA, 2009)	Operational	See Section 7.4.4.6 Predicted collision risk 0.64 collisions/year (99% avoidance) – see Table 7-9	Long-term Low (1-5%)	Low significance	Assessment is highly precautionary, based on population viability studies – see APEM, (2013), MacArther Green (2019) & Potiek et al., (2019), which suggests that levels of additional mortality required to	Based on literature review, magnitude of effect for predicted collision risk is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003), over the long-term

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
Medium sensitivity (Percival, 2003)					have any discernible effect on the regional population, i.e. induce population decline, would need to be substantially higher than a 1% additional effect on background mortality.	(EPA, 2022) on a regionally important population (NRA, 2009)
Jack snipe – wintering Max. count 1 Local (high) (NRA, 2009) Low sensitivity – precautionary (Percival, 2003)	Construction	See Section 7.4.2.19 Disturbance/ displacement	Short-term Low (1-5%)	V. low significance	Embedded mitigation - avoidance of wetland habitats (Section 7.5.1.1) No mitigation proposed - Highly precautionary assessment and based on Percival (2003) a species with favourable conservation status would fall below the level requiring assessment, i.e. is classed as having below low sensitivity.	Re-evaluated with a low (1-5%) magnitude effect on a below low sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003), over the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009)
Swift - summer Foraging 2-25 birds Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Operational	See Section 7.4.4.26 Additional collision risk modelling indicates potential for moderate magnitude effect	Long-term Mod (6-20%)	Low significance	Provision of nest boxes to offset any predicted collision risk (Section 7.5.1.3)	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the long-term (EPA, 2022) on a regional important population (NRA, 2009)
Stock dove - breeding 1 pair Local (high) importance (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.28 Direct/indirect effects to nesting birds	Short-term Negl. (< 1%) to Low (1-5%)	Not or low significance	Embedded mitigation – avoidance/retention of woodland habitats (Section 7.5.1.1) Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2)	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009) – any slight/imperceptible (EPA, 2022) effects are reversible
Kestrel - resident Est. 2 pairs in wider area, 4-6 birds in area, frequently foraging in Site Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.21 Potential for direct effect if nest located in construction corridor	Long-term Low (1-5%)	Low significance	Precautionary assessment as known nest sites all beyond 500 m turbine buffer Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2)	With mitigation in place any breeding sites will be protected during constructions and risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a neutral effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a regional important population (NRA, 2009)
	Operational	See Section 7.4.4.20 Predicted collision risk	Long-term Mod. (6-20%)	Low significance	See Section 7.5.1.3 – measures for kestrels Offsetting - provision of nest boxes	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
		0.21 collisions/year (95% avoidance) – see Table 7-9			Reduce prey availability around turbines - removal of vegetation cleared for turbine-bat feature	long-term (EPA, 2022) on a regional important population (NRA, 2009)
Peregrine – resident Pair nest within 350m of borrow pit & within 600m of closest turbine Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.23 Disturbance/ displacement	Short-term Mod. (6-20%)	Low significance	See Section 7.5.2.1 – measure for peregrine Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2)	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a regional important population (NRA, 2009)
	Operational	See Section 7.4.4.22 Predicted collision risk 0.02 collisions/year (98% avoidance) – see Table 7-9 Precautionary assessment for fledged birds – Low	Long-term Low (1-5%)	Low significance	See Section 7.5.2.2 – measures for peregrine Nest monitoring protocol for recently fledged young to ensure safe dispersal	With mitigation in place, risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a negative effect that is **not significant** (Percival, 2003) over the long-term (EPA, 2022) on a regional important population (NRA, 2009)
Riverine species <u>Medium sensitivity species</u> - Cormorant (CA) - Kingfisher (KF) - Little egret (ET) <u>Low sensitivity species</u> - Grey heron (H.)	Construction | Operational	Deterioration in water quality – see Sections CA: 7.4.2.7 | 7.4.4.7 KF: 7.4.2.11 | 7.4.4.11 ET: 7.4.2.12 | 7.4.4.12 H.: 7.4.2.18 | 7.4.4.13	Short-term | Long-term Low (1-5%) to Mod. (6-20%)	V. low to Med. significance	Comprehensive mitigation plan to protect water quality during construction and throughout operations (Section 7.5.1.2| Section 7.5.1.3)	With mitigation in place to protect water quality during construction and throughout operations, the risk/magnitude of effect is downgraded to negligible (< 1%) for all riverine species, resulting in a negative (neutral) effects that are **not significant** (Percival, 2003) over the short-term (EPA, 2022) for construction and over long-term (EPA, 2022) the operational phase
Barn owl - resident 1 pair within 1.5 km Regionally important (NRA, 2009) Medium sensitivity (Percival, 2003)	Construction	See Section 7.4.2.22 Potential for indirect | direct effects if nest located adjacent to or within construction corridor	Short-term | Long-term (destruction of nest)	Low significance	Precautionary assessment as known nest sites all beyond 500 m turbine buffer Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2)	With mitigation in place any breeding sites will be protected during constructions and risk/magnitude of effect is downgraded to negligible (< 1%) on a medium sensitivity receptor resulting in a neutral effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a regional important population (NRA, 2009)
Buzzard – resident Est. 3 pairs, 6 adults plus 4-6 juv. Local (high) importance (NRA, 2009)	Construction	See Section 7.4.2.25 Direct/indirect effects to nesting birds	Permanent – loss of nest location Short-term disturbance Low (1-5%)	V. low significance	See Section 7.4.2.25 A buzzard nesting location in the woodland south of T04 will be permanently lost - woodland will only be removed out of the breeding season to avoid any direct impact while birds may be on the nest - species is tolerant to this	Loss of nesting location will be permanent; however by avoiding direct effects, retaining woodland within the Proposed Project Site and considering the very low sensitivity of the receptor, magnitude of effect is downgraded to negligible (< 1%) on a resulting in a negative effect that is **not significant** (Percival, 2003) over

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
Low sensitivity – precautionary (Percival, 2003)					kind of disturbance, as pairs generally have several nesting options within their home ranges.	the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009)
	Operational	See Section 7.4.4.24 Predicted collision risk 0.86 collisions/year (98% avoidance) – see Table 7-9	Long-term Mod. (6-20%)	Low significance	Population level effects will be imperceptible due life history (see Section 7.3.5.3) – in addition this is a precautionary assessment, as based on Percival (2003) a species with favourable conservation status would fall below the level requiring assessment, i.e. is classed as having below low sensitivity.	very low sensitivity of the receptor, magnitude of effect is downgraded to negligible (< 1%) on a resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009)
Sparrowhawk – resident Est. 2-3 pairs, 4-6 birds Local (high) importance (NRA, 2009) Low sensitivity – precautionary (Percival, 2003)	Construction	See Section 7.4.2.24 Direct/indirect effects to nesting birds	Short-term Low (1-5%)	V. low significance	Embedded mitigation – avoidance/retention of woodland habitats (Section 7.5.1.1) Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2) Precautionary assessment and based on Percival (2003) a species with favourable conservation status would fall below the level requiring assessment, i.e. is classed as having below low sensitivity.	With mitigation in place and re-evaluated as very low sensitivity of the receptor, magnitude of effect is downgraded to negligible (< 1%) on a resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009)
Long-eared owl – resident 1 pair Local (high) importance (NRA, 2009) Low sensitivity – precautionary (Percival, 2003)	Construction	See Section 7.4.2.26 Direct/indirect effects to nesting birds	Short-term Low (1-55)	V. low significance	Embedded mitigation – avoidance/retention of woodland habitats (Section 7.5.1.1) Ornithological supervision of works to implement appropriate protection measures (Section 7.5.1.2) Precautionary assessment and based on Percival (2003) a species with favourable conservation status would fall below the level requiring assessment, i.e. is classed as having below low sensitivity.	Re-evaluated as a very low sensitivity of the receptor, magnitude of effect is downgraded to negligible (< 1%) on a resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009)
	Operational	See Section 7.4.4.25 Disturbance/displacement	Short-term Low (1-5%)	V. low significance	Embedded mitigation – avoidance/retention of woodland habitats (Section 7.5.1.1) Potential for level of short-term displacement, with birds anticipated	Re-evaluated as a very low sensitivity of the receptor, magnitude of effect is downgraded to negligible (< 1%) on a resulting in a negative effect that is **not significant** (Percival, 2003) over the short-term (EPA, 2022) on a population of local (higher value) importance (NRA, 2009)

Important ecological feature	Project phase	Description of impact	Duration (EPA, 2022) Magnitude (Percival, 2022)	Significance without mitigation (Percival, 2003)	Proposed mitigation measures/compensation	Residual Effect (Post-Mitigation)
					habituate – as above precautionary assessment.	

7.7 References

A full reference list is available in Appendix 7A.