

Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume II, Chapter 12: Offshore Ornithology (Revised March 2026)

sse Renewables

Version	Date	Status	Author	Reviewed by	Approved by
1.0	24/04/2024	Final (External)	Mac Arthur Green	GoBe Consultants	Sure Partners Limited
2.0	27/10/2025	Final External (Revised March 2026)	SLR	GoBe Consultants	Sure Partners Limited

Statement of Authority

Experts	Qualifications	Relevant Experience
Dr Mark Trinder	BSc. (Hons), MSc., PhD	Mark has over 15 years of undertaking offshore wind farm ornithological impact assessments in the UK, including all aspects of data analysis, reporting, and representation at public examinations. He has also contributed to a range of statutory guidance.
Dr Shirley Raveh	BSc. (Hons), MSc., PhD	Shirley has a track record in academic research of animal responses to changes in their environments which has given her an ideal background for conducting offshore wind farm impact assessment.
Ruth Peters-Grundy	M.Sc. Wildlife Biology and Conservation, Edinburgh Napier University (2019) B.Sc. (Hons) Biology with Applied Environmental Science, Keele University (2014).	Ruth Peters-Grundy is Senior Ecological Consultant at HiDef Aerial Surveying Ltd. Ruth has 5 years of experience in Offshore Environmental Consultancy, focused on marine mammals and marine ornithology. She has worked on multiple large offshore wind projects, including undertaking Environmental Impact Assessment and Habitats Regulation Assessment/Appraisal, as well as conducting a variety of external and internal research and development projects.
Carl Dixon	B.Sc. (Hons.) in Biology (Ecology) and M.Sc in Ecological Monitoring from University College Cork	Carl is a senior ecologist who has over 25 years' experience in ecological assessment. Prior to setting up DixonBrosnan Environmental Consultants in 2000, Carl set up and ran Core Environmental Services which included REPS planning for landowners and ecological assessments. Carl has particular experience in freshwater ecology, including electrofishing fish stock assessments and water quality assessments. He also has considerable experience in habitat mapping and mammal ecology including survey work and reporting in relation to Badgers and bats. Other competencies include surveys for invasive species and bird surveys.

Experts	Qualifications	Relevant Experience
		Carl has extensive experience with regards to EIAR and NIS mitigation and impact assessment. He has experience in large-scale industrial developments with extensive experience in complex assessments as part of multi-disciplinary teams. Such projects include gas pipelines, incinerators, electrical cable routes, oil refineries and quarries.

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Glossary

Term	Meaning
Arklow Bank Wind Park 1 (ABWP1)	Arklow Bank Wind Park 1 consists of seven wind turbines, offshore export cable and inter-array cables. Arklow Bank Wind Park 1 has a capacity of 25.2 MW. Arklow Bank Wind Park 1 was constructed in 2003/04 and is owned and operated by Arklow Energy Limited. It remains the first and only operational offshore wind farm in Ireland.
Arklow Bank Wind Park 2 – Offshore Infrastructure	"The Proposed Development", Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements under the existing Maritime Area Consent.
Arklow Bank Wind Park 2 (ABWP2) (the Project)	Arklow Bank Wind Park 2 (ABWP2) (The Project) is the onshore and offshore infrastructure. This EIAR is being prepared for the Offshore Infrastructure. Consents for the Onshore Grid Infrastructure (Planning Reference 310090) and Operations Maintenance Facility (Planning Reference 211316) has been granted on 26th May 2022 and 20th July 2022, respectively. • Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements to be consented in accordance with the Maritime Area Consent. This is the subject of this EIAR and will be referred to as 'the Proposed Development' in the EIAR. • Arklow Bank Wind Park 2 Onshore Grid Infrastructure: This relates to the onshore grid infrastructure for which planning permission has been granted. • Arklow Bank Wind Park 2 Operations and Maintenance Facility (OMF): This includes the onshore and nearshore infrastructure at the OMF, for which planning permission has been granted. • Arklow Bank Wind Park 2 EirGrid Upgrade Works: any non-contestable grid upgrade works, consent to be sought and works to be completed by EirGrid.
Array Area	The Array Area is the area within which the Wind Turbine Generators (WTGs), the Offshore Substation Platforms (OSPs), and associated cables (export, inter- array and interconnector cabling) and foundations will be installed.
Cable Corridor and Working Area	The Cable Corridor and Working Area is the area within which export, inter-array and interconnector cabling will be installed. This area will also facilitate vessel jacking operations associated with installation of WTG structures and associated foundations within the Array Area.

Term	Meaning
Competent Authority (CA)	The authority designated as responsible for performing the duties arising from the EIA Directive as amended. For this application, the Competent Authority is An Bord Pleanála (ABP).
Environmental Impact Assessment (EIA)	An Environmental Impact Assessment (EIA) is a statutory process by which certain planned Projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council (EIA Directive) and the regulations transposing the EIA Directive (EIA Regulations)
EirGrid	State-owned electric power transmission system operator (TSO) in Ireland and Transmission Asset Owner (TAO) for the Project's transmission assets.
Intertidal area	The area between the high water mark (HWM) and the low water mark (LWM).
Landfall	The area in which the offshore export cables make landfall and is the transitional area between the offshore cabling and the onshore cabling.
Maritime Area Consent (MAC)	A consent to occupy a specific part of the maritime area on a non-exclusive basis for the purpose of carrying out a Permitted Maritime Usage strictly in accordance with the conditions attached to the MAC granted on 22nd December 2022 with reference number 2022-MAC-002.
Mitigation Measure	Measure which would avoid, reduce, or offset an impact.
Permitted Maritime Usage	The construction and operation of an offshore wind farm and associated infrastructure (including decommissioning and other works required on foot of any permission for such offshore wind farm).
The Application	The full set of documents that will be submitted to An Bord Pleanála in support of the consent.
The Developer	Sure Partners Ltd.

Acronyms

Term	Meaning
AA	Appropriate Assessment
ABP	An Bord Pleanála
ABWP1	Arklow Bank Wind Park 1
ABWP2	Arklow Bank Wind Park 2
BDMPS	Biologically Defined Minimum Population Scale
BoCCI	Birds of Conservation Concern in Ireland
BTO	British Trust for Ornithology
CFP	Common Fisheries Policy
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CRM	Collision Risk Modelling
DAERA	Department of Agriculture, Environment and Rural Affairs
DECC	Department for Energy and Climate Change
DHLGH	Department of Housing, Local Government and Heritage
ECMG	East Coast Monitoring Group
EEZ	European Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ESAS	European Seabirds At Sea

Term	Meaning
EU	European Union
EVMP	Environmental Vessel Management Plan
HPAIV	highly pathogenic avian influenza virus
HRA	Habitats Regulations Assessment
HWM	High Water Mark
IBMs	Individual Based Models
IMO	International Maritime Organisation
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
MAP Act	Maritime Area Planning Act 2021
MDSS	Material Data Safety Sheet
MPCP	Marine Pollution Contingency Plan
MPDM	Marine Planning and Development Management
NAF	nocturnal activity factor
NIEA	Northern Ireland Environmental Agency
NMPF	National Marine Planning Framework
NPWS	National Parks and Wildlife Service
NRW	Natural Resources Wales
OGI	Onshore Grid Infrastructure
OMF	Operations and Maintenance Facility
OREDP	Offshore Renewable Energy Development Plan
OSP	Offshore Substation Platform
OWEZ	Egmond aan Zee Offshore Windfarm

Term	Meaning
PAWP	Princess Amalia Windpark
PCH	Potential Collision Height
PVA	Population viability analysis
RPM	Revolutions Per Minute
RSPB	Royal Society for the Protection of Birds
SEAI	Sustainable Energy Authority of Ireland
SNCB	Statutory Nature Conservation Bodies
SNH	Scottish Natural Heritage
SOSS	Strategic Ornithological Support Services
SPA	Special Protection Area
UK	United Kingdom
VP	Vantage Points
WTG	Wind Turbine Generator
WWT	Wildfowl and Wetlands Trust
ZoI	Zone of Influence

Units

Unit	Description
Km^2	Square kilometre (area)
Km	Kilometre
MW	Megawatt
m	metre

12 Offshore Ornithology

Summary of changes

This Chapter has been updated to reflect changes since submission of the planning application to An Bord Pleanála (ABP) (now An Coimisiún Pleanála (ACP)) in June 2024. All references to ABP, should be considered ACP throughout the document.

The changes that have been made are in response to the Request for Information (RFI) that was received and matters that have been raised therein. The Developer confirms that this Chapter has been based on up-to-date survey reports and data and that that the information submitted is relevant and appropriate at the point of submission (i.e. March 2026). In summary, the following sections of this Chapter have been amended (please note that this is non-exhaustive):

- Section 12.1 (Introduction) has been updated to identify any new or revised documentation of relevance to the amended chapter;
- Section 12.2 (Regulatory Context) has considered the latest policy and legislation of relevance to the assessment;
- Section 12.3 (Consultation) has been updated to reflect consultation that has occurred post-application in relation to matters raised via the RFI;
- Section 12.5 (Methodology) has been updated to reflect appropriate and relevant data that has been published and/or gathered since the original submission was made.
- Section 12.6 (Impact Assessment Methodology) has considered the latest project design (as detailed in Volume II, Chapter 4: Description of Development (Revised March 2026)) as well as provided clarification in response to the RFI on the impacts scoped in/out where requested, so as to clearly demonstrate the logic and appropriateness of the assessment that has been undertaken.
- Section 12.9 (Assessment) represents the updated assessment which has been amended to reflect the latest information (i.e. as described above) and any updates required in line with matters raised via the RFI;
- Section 12.11 (Cumulative Assessment) have been updated to reflect the latest information and to align with NSIP (2024) guidance as requested via the RFI;
- Section 12.13 (Summary of Effects) has been updated to reflect the updates that have been made throughout the chapter.

In addition to those changes above, all other sections of this chapter have been adjusted to ensure consideration of the latest information as appropriate to ensure consistency and accuracy. Clarification and/or further detail has also been provided where this has been requested via the RFI, relevant figures and tables have been updated as required and it is confirmed that all cross-references have been updated throughout to ensure accuracy.

Additionally, in support of the necessary changes to the chapter, it is noted that the following updates have been made to the appendices supporting this chapter:

- Revised Appendices:
  - Volume III, Appendix 12.1: Offshore Ornithology Technical Report – Overview (Revised March 2026) – This is an updated appendix that supersedes the previous version.
  - Volume III, Appendix 12.2: Offshore Ornithology Technical Report – Monthly Seabird Densities (Revised March 2026)) – This is an updated appendix that supersedes the previous version.

- Volume III, Appendix 12.3: Offshore Ornithology Technical Report – Monthly Seabird Abundance (Revised March 2026) – This is an updated appendix that supersedes the previous version.
- Volume III, Appendix 12.4: Offshore Ornithology: Technical Report – Seabird Collision Risk Input Parameters (Revised March 2026) - This is an updated appendix that supersedes the previous version.
- Volume III, Appendix 12.5: Offshore Ornithology: Technical Report - Seabird Collision Modelling Results (Revised March 2026) - This is an updated appendix that supersedes the previous version.
- Volume III, Appendix 12.6: Offshore Ornithology: Technical Report - Seabird Species Abundance Plots (Revised March 2026) - This is an updated appendix that supersedes the previous version.
- Volume III, Appendix 12.7: Offshore Ornithology: Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026) - This is an updated appendix that supersedes the previous version.
- Volume III, Appendix 12.8: Offshore Ornithology: Technical Report - Seabird Spatial Distribution Maps (Revised March 2026) - This is an updated appendix that supersedes the previous version.
- Volume III, Appendix 12.10: Offshore Ornithology: Technical Report - Kittiwake population viability analysis (PVA) (Revised March 2026) - - This is an updated appendix that supersedes the previous version.

- New Appendices:
  - Volume III, Appendix 12.12: Offshore Ornithology Technical Report - Kittiwake Collision Risk Modelling at ABWP1 (RFI March 2026) – This is a new appendix.
  - Volume III, Appendix 12.13: Offshore Ornithology Technical Report - Kittiwake Displacement Evidence Review (RFI March 2026) – This is a new appendix.
  - Volume III: Appendix 12.14: Offshore Ornithology Technical Report - Kittiwake Displacement Matrices (RFI March 2026) – This is a new appendix.
  - Volume III, Appendix 12.15: Offshore Ornithology Technical Report - Seabird Breeding Reference Populations (RFI March 2026)– This is a new appendix.
  - Volume III, Appendix 12.16: Wicklow Head Seabird Monitoring (RFI March 2026) – This is a new appendix.
  - Volume III, Appendix 12.17: Kittiwake Flight Height Survey Report (RFI March 2026)– This is a new appendix.
  - Volume III, Appendix 12.18: Kittiwake Tracking Report (RFI March 2026) – This is a new appendix.
  - Volume III, Appendix 12.19: Migratory Bird Survey Methods (RFI March 2026)– This is a new appendix.
  - Volume III, Appendix 12.20: Migratory Bird Survey Report (RFI March 2026) – This is a new appendix.

12.1 Introduction

12.1.1.1 This Chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the potential impacts of the Arklow Bank Wind Park 2 (ABWP2) Offshore Infrastructure (hereafter referred to as 'the Proposed Development') on Offshore Ornithology. Specifically, this Chapter considers the potential impact of the Proposed Development below the High Water Mark (HWM) during the construction, operational and maintenance, and decommissioning phases.

12.1.1.2 The assessment presented is informed by the following technical Chapters:

- Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026); and
- Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026).

12.1.1.3 This Chapter has been prepared by MacArthur Green using digital aerial survey data collected by HiDef Aerial Surveying Limited ('HiDef').

12.1.1.4 The HiDef team that undertook the surveys comprised:

- Richard Schofield: European Seabirds at Sea (ESAS) certified, over 40 years ornithological technical expertise;
- Pete Ullrich: over 10 years ornithology surveying of UK offshore windfarm sites and 40 years ornithological technical expertise;
- Micky Maher: over 15 years undertaking work for the Royal Society for the Protection of Birds (RSPB), JNCC, NatureScot, National Trust and Scottish Wildlife Trusts, authored several bird identification scientific papers;

12.1.1.5 The MacArthur Green team (now part of SLR) that undertook the assessment comprised:

- Dr Mark Trinder: Principal Ornithologist with over 20 years of wildlife impact assessment experience, working for the Institute of Zoology, Wildfowl and Wetlands Trust, RPS, MacArthur Green and SLR. Biology BSc. (Hons), Wildlife Management and Control (MSc.) and PhD in population modelling;
- Dr Shirley Raveh: Senior Consultant. 18 months consultancy experience, preceded by over 10 years of research experience studying wildlife responses to environmental change.

12.1.1.6 This Chapter draws upon information contained within the following technical appendices:

- Volume III, Appendix 12.1: Offshore Ornithology Technical Report – Overview (Revised March 2026);
- Volume III, Appendix 12.2: Offshore Ornithology Technical Report - Monthly Seabird Densities (Revised March 2026);
- Volume III, Appendix 12.3: Offshore Ornithology Technical Report - Monthly Seabird Abundance (Revised March 2026);
- Volume III, Appendix 12.4: Offshore Ornithology Technical Report - Collision Risk Input Parameters (Revised March 2026);
- Volume III, Appendix 12.5: Offshore Ornithology Technical Report - Seabird Collision Modelling Tabulated Results (Revised March 2026);
- Volume III, Appendix 12.6: Offshore Ornithology Technical Report - Seabird Species Abundance Plots (Revised March 2026);
- Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026);
- Volume III, Appendix 12.8: Offshore Ornithology Technical Report - Seabird Spatial Distribution Maps (Revised March 2026);
- Volume III, Appendix 12.9: Offshore Ornithology Technical Report - Review of Seabird Monitoring Data: 2000 to 2010;
- Volume III, Appendix 12.10: Offshore Ornithology Technical Report - Kittiwake population viability analysis (PVA) (Revised March 2026); and
- Volume III, Appendix 12.11: Offshore Ornithology Technical Report - Arklow Bank Wind Park 2 Onshore Cable Corridor and Landfall – Baseline Bird Survey.
- Volume III, Appendix 12.12: Offshore Ornithology Technical Report - Kittiwake Collision Risk Modelling at ABWP1 (RFI March 2026).
- Volume III, Appendix 12.13: Offshore Ornithology Technical Report - Kittiwake Displacement Evidence Review (RFI March 2026).

- Volume III, Appendix 12.14: Offshore Ornithology Technical Report - Kittiwake Displacement Matrices (RFI March 2026).
- Volume III, Appendix 12.15: Offshore Ornithology Technical Report - Seabird Breeding Reference Populations (RFI March 2026).
- Volume III, Appendix 12.16: Offshore Ornithology Technical Report - Wicklow Head Seabird Monitoring (RFI March 2026).
- Volume III, Appendix 12.17: Offshore Ornithology Technical Report - Kittiwake Flight Height Survey Report (RFI March 2026).
- Volume III, Appendix 12.18: Offshore Ornithology Technical Report - Kittiwake Tracking Report (RFI March 2026).
- Volume III, Appendix 12.19: Offshore Ornithology Technical Report - Migratory Bird Survey Methods (RFI March 2026).
- Volume III, Appendix 12.20: Offshore Ornithology Technical Report - Migratory Bird Survey Report (RFI March 2026).

12.2 Regulatory background

12.2.1.1 Planning policy on renewable energy infrastructure is presented in Volume II, Chapter 2: Policy and Legislation (Revised March 2026). Planning policy, specifically in relation to offshore ornithology, is contained in the National Marine Planning Framework (NMPF) (Department of Housing, Local Government and Heritage (DHLGH), 2021). A summary of the policy provisions relevant to offshore ornithology are provided in Table 12.1 and Table 12.2, with other relevant policy provisions set out Table 12.4.

12.2.1.2 The relative position of the Irish offshore wind industry compared with that of other European countries such as the UK means that there is no specific statutory guidance in Ireland on ornithology impact assessment for offshore windfarms. Therefore, the well-developed UK guidance, produced by NatureScot and Natural England has been used for this assessment. An Ornithology Method Statement (Method Statement – Offshore Wind Ornithology Assessment for East Coast Phase 1 Projects (Revision: 1.0), setting out the technical details for conducting the assessment was produced jointly by the Irish Phase 1 east coast windfarm projects (Arklow Bank Wind Park 2, Codling Wind Park, Oriel Windfarm, Dublin Array, North Irish Sea Array). This was submitted to the National Parks and Wildlife Service (NPWS) for review (see section 12.3 for details). The approach outlined in the Joint Method Statement and the comments received has formed the basis for this assessment.

Table 12.1: Summary of regulatory background

Publisher	Name of document incl. reference	Key provisions
Statutory		
Legislation		
European Commission, 2011	European Communities (Marine Strategy Framework) Regulations 2011 (S.I. No. 249 of 2011);	Transposes European Union (EU) Directive 2008/56/EC (Marine Strategy Framework Directive) into Irish law.
Planning Policy and Development Control		
DECC, 2022	Strategic Environmental Assessment (SEA) of the Offshore Renewable Energy Development Plan (OREDP I and SC-DMAP) in Ireland: Environmental Report https://www.gov.ie/en/publication/e13f49-offshore-renewable-energy-development-plan/ https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/the-south-coast-designated-maritime-area-plan-for-offshore-renewable-energy-sc-dmap/	Contains the AA screening process and SEA scoping report of the Maritime area associated with OREDPII. This resource has some important information on existing baseline conditions in the maritime area.
DHLGH, 2021	National Marine Planning Framework (NMPF)	Sets out Ireland's National Marine Spatial Plan. **Biodiversity Policy 1** Proposals incorporating features that enhance or facilitate species adaptation or migration, or natural native habitat connectivity will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals that may have significant adverse impacts on

Publisher	Name of document incl. reference	Key provisions
		species adaptation or migration, or on natural native habitat connectivity must demonstrate that they will, in order of preference and in accordance with legal requirements: a) avoid, b) minimise, or c) mitigate significant adverse impacts on species adaptation or migration, or on natural native habitat connectivity. These have been considered in section 12.9. **Biodiversity Policy 2** Proposals that protect, maintain, restore and enhance the distribution and net extent of important habitats and distribution of important species will be supported, subject to the outcome of statutory environmental assessment processes and subsequent decision by the competent authority, and where they contribute to the policies and objectives of this NMPF. Proposals must avoid significant reduction in the distribution and net extent of important habitats and other habitats that important species depend on, including avoidance of activity that may result in disturbance or displacement of habitats. These have been considered in section 12.9. **Biodiversity Policy 3** Where marine or coastal natural capital assets are recognised by Government: • Proposals must seek to enhance marine or coastal natural capital assets where possible.

Publisher	Name of document incl. reference	Key provisions
		• Proposals must demonstrate that they will in order of preference, and in accordance with legal requirements: a) avoid, b) minimise, or c) mitigate significant adverse impacts on marine or coastal natural capital assets, or d) if it is not possible to mitigate significant adverse impacts on marine or coastal natural capital assets proposals must set out the reasons for proceeding. These have been considered in section 12.9. **Biodiversity Policy 4** Proposals must demonstrate that they will, in order of preference and in accordance with legal requirements: a) avoid, b) minimise, or c) mitigate significant disturbance to, or displacement of, highly mobile species. These have been considered in section 12.9.
Guidelines and technical standards		

Publisher	Name of document incl. reference	Key provisions
CIEEM (2022)	Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1.	This presents the most relevant Environmental Impact Assessment (EIA) guidance for offshore ornithology assessment.
Natural England (Parker *et al.* 2022 a, b, c)	Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications. Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase II: Expectations for pre-application engagement and best practice advice for the evidence plan process. Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase III: Expectations for data analysis and presentation at examination for offshore wind applications	Best practice methods for data collection, analysis, presentation and impact assessment for use on English projects
NatureScot (2023)	Advice on marine renewables development	Best practice methods for data collection, analysis, presentation and impact assessment for use on Scottish projects
EPA, 2022	Guidelines on the Information to be Contained in Environmental Impact Assessment Reports https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf	These Guidelines apply to the preparation of all Environmental Impact Assessment Reports undertaken in the State (Ireland)
DCCAE, 2018	Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects Part 2 April 2018	Provides technical guidance for the baseline data requirements and monitoring necessary to evaluate potential environmental impacts of offshore renewable energy projects in the marine area

12.3 Consultation

Table 12.2: Summary of consultation relating to Offshore ornithology

Date	Consultation type	Consultation and key issue raised	Section where provision is addressed
December 2018	Birdwatch Ireland – consultation meeting	Discussion of proposed project design, data sources and methods for defining the project baseline, identification of sensitive receptors and assessing potential impacts.	Data sources and methods for defining the baseline are presented in section 12.5.2. Potential impacts are assessed in section 12.8.
January 2019	National Parks and Wildlife Service – consultation meeting	Discussion of proposed project design, data sources and methods for defining the project baseline, identification of sensitive receptors and assessing potential impacts.	Data sources and methods for defining the baseline are presented in section 12.5.2. Potential impacts are assessed in section 12.8.
September 2019	National Parks and Wildlife Service – consultation meeting	Discussion of detailed impact assessment methods (e.g. collision risk modelling) and approach to Natura Impact Assessment.	Impact assessment methodology is presented in section 12.6. Potential impacts are assessed in section 12.8.
May 2020	National Parks and Wildlife Service – consultation meeting	Discussion of preliminary results of impact assessment and proposed next steps.	Potential impacts are assessed in section 12.8.
October 2020	Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (DAERA) – Scoping response	Agreement that proposed approach to data collection and analysis and assessment methodologies are appropriate.	Data sources and methods for defining the baseline are presented in section 12.5.2. Impact assessment methodology is presented in section 12.6.
November 2022	National Parks and Wildlife Service – consultation meeting	Update on assessment under the Maritime Area Planning Act 2021 (MAP Act), queries about technical approach to	Relevant legislation and guidance applied in this assessment is discussed in section 12.2

Date	Consultation type	Consultation and key issue raised	Section where provision is addressed
		assessment and proposed next steps.	Methods have taken account of requests as appropriate.
November 2023	National Parks and Wildlife Service – review of Phase 1 Projects Joint Ornithology Method Statement	Detailed report considering the technical details for assessing ornithological impacts of the windfarms.	Responses to the points raised are provided in section 12.3.1 and Table 12.3
August 2023	Meeting with National Parks and Wildlife Service	Discussion on environmental assessment process undertaken for ABWP2 and coastal SPA colonies.	See Section 12.6
February 2024	Meeting with National Parks and Wildlife Service	Update on environmental assessments including Wicklow Head SPA and surveys.	See Section 12.6
November 2025	Meeting with National Parks and Wildlife Service	Meeting to clarify observations received from Development Applications Unit.	See Section 12.6

12.3.1 Phase 1 Projects Joint Ornithology Method Statement

12.3.1.1 The east coast Irish Phase 1 Projects (Arklow Bank Wind Park 2; Codling Wind Park; Oriel Windfarm; Dublin Array and North Irish Sea Array) worked together to produce an Offshore Ornithology Assessment Methodology Note. This was prepared in order to align the methods across the Phase 1 projects and reduce the number of documents from individual Phase 1 projects seeking agreement with NPWS (within similar project timeframes) on the approaches and input parameters for ornithological assessment within the jurisdiction of the Republic of Ireland. The Method Statement was submitted to NPWS in December 2022.

12.3.1.2 The methods adopted best practice, evidence based approaches from the UK Offshore Windfarm Industry which themselves have developed over a period of almost 20 years. The note covered impact assessment methods for collision risk modelling and displacement analysis as well as definitions for biological seasons (e.g. identification of species specific breeding seasons), age class subdivisions (e.g. proportions of juvenile, immature and adults in the populations) and approach to PVA for estimating population consequences from windfarm development.

12.3.1.3 The NPWS commissioned a review of the Method Statement (hereafter 'the NPWS review') from ABPMer which was provided to the Phase 1 Projects in November 2023. The NPWS review gave consideration to the species to be assessed and the proposed impact assessment methods (collision risk modelling, displacement analysis). The points raised are summarised in Table 12.3

along with the Developer's responses and the sections of the assessment where further details have been provided.

Table 12.3: Summary of NPWS commissioned review of Phase 1 Projects Joint Ornithology Method Statement, the Developer responses and sections where addressed

Review section heading	Topic	Summary of review comment	The Developer response and section where provision is addressed (if appropriate)
1.2.2	Ornithological receptors	A high level review of seabird species with potential to be encountered in the Phase 1 windfarms was presented based on seabird colony counts (Mitchell *et al.* 2004). This suggested 20 species could be recorded.	The Joint Method Statement did not list all species recorded across all projects but rather focussed on the ones expected to be of primary interest, based on experience from UK assessments. Importantly, the species considered in the assessment for the Proposed Development were those recorded in the baseline surveys (Table 12.7), most of which were in fact included in this list. Other evidence, such as shore based surveys and older monitoring data has also been used throughout this assessment and is referenced wherever appropriate.
1.2.2	Determining connectivity	Methods for refining the list of potential receptors for assessment should consider tracking studies where available	An industry standard approach has been adopted, whereby connectivity is determined using available evidence, underpinned by reviews of foraging studies (Woodward *et al.* 2019).
2.1	Collision Risk	The review advised that the stochastic (i.e. randomised input values) version of the Band (2012) collision model should be used rather than the original deterministic one.	The stochastic Band model (sCRM) has been used for the assessment of the Proposed Development. However it should be noted that both stochastic and deterministic versions return the same mean values as the former is simply the latter run multiple times with randomised inputs and does not functionally differ.
2.1	Collision Risk	In response to a commitment from the Phase 1 Projects to present a mean output for combining across projects (in their cumulative assessments) a rationale was requested for why 'only' the mean would be presented.	This request appears to misunderstand the Joint Method Statement. The point was that to ensure that each Phase 1 Project provided comparable central place values to be summed for the cumulative assessments. Each Phase 1 Project will also present measures of uncertainty around those central values, but it is not appropriate to sum measures of variance around those central values (e.g. 95% confidence intervals) in the cumulative

Review section heading	Topic	Summary of review comment	The Developer response and section where provision is addressed (if appropriate)
			assessment. The collision modelling results are presented and assessed in section 12.9.8, 12.9.9 and 12.9.10 and cumulatively in section 12.11.4.
2.1	Collision Risk	Selection of flight height data and other seabird parameters should be fully justified.	The collision risk modelling methods and input parameter values used have followed UK best practice and also made reference to new evidence where appropriate (sections 12.9.8, 12.9.9 and 12.9.10 and Technical Appendix 12.04).
2.1	Collision Risk	Species included in the CRM	Species have been assessed on the basis of both their presence in the survey data and an understanding of their risks to collision based on many years of assessment in the UK and elsewhere. A precautionary approach has been taken, with species screened in where the risks cannot be ruled out (section 12.9.8).
2.1	Collision vs displacement	Queries about how windfarm avoidance was to be applied to the collision risk and displacement assessment for gannet	The avoidance and displacement rates for gannet have followed UK best practice guidance (Parker *et al.* 2022a,b,c) and are set out in sections 12.9.8, 12.9.9 and 12.9.10.
2.2	Disturbance and displacement	Suggestion that Individual Based Models (IBMs) should be used for the displacement assessment, rather than the displacement matrix method proposed.	While the merits of IBMs are acknowledged, these methods require long term detailed studies of individual birds. Such data are not available for any of the seabird colonies connected to the Phase 1 windfarms (nor indeed to more than a few windfarms anywhere) and therefore such approaches are not applicable here.
2.2	Mortality rates	There is a need to clarify what mortality rates are to be used and the evidence that underpins them.	The source document for mortality rates is provided throughout the relevant sections of the assessment. Mortality rates for displaced birds of up to 10% have been considered in the assessment.
2.2	Density data	There is a need to clarify how the weights would be calculated for the	This referred to giving consideration to how cumulative effects during the nonbreeding season might need to take account of

Review section heading	Topic	Summary of review comment	The Developer response and section where provision is addressed (if appropriate)
		proposed weighted mean approach	apparent movements of birds between different windfarms, to avoid double counting of peaks occurring sequentially across windfarms as birds move through the course of the season. This approach has not been used in this assessment as no pattern of this nature was apparent in the shared data.
2.2	Density data	Request to provide evidence that kittiwake and Manx shearwater are not at risk of displacement effects, the latter with particular reference to Dundalk Bay.	Monitoring conducted at UK windfarms has found very little evidence that kittiwake are displaced by offshore windfarms (MacArthur Green 2023, Degraer *et al.* 2023, Trinder *et al*. 2024). With respect to Manx shearwater and their association with Dundalk Bay, the Proposed Development is located a considerable distance from Dundalk Bay (>100km) and is not located between the bay any colonies. Therefore, there is no justification for screening this species into the displacement assessment unless it was recorded during the surveys, in the same manner that other species have been screened in or out of the assessment (section 12.9.2). References in support of the screening decisions for the displacement assessment are provided in section 12.9.2.
2.2.4	Barrier effects	Details on how individual Projects may consider barrier effects (over and above displacement) was requested	The Proposed Development is not considered to present a barrier to movement, either alone or cumulatively with the other Phase 1 projects, therefore no specific consideration of barrier effects has been necessary.
2.3	Breeding seasons	Request for additional evidence to justify departure from season definitions in Furness (2015)	The Developer has used the Furness (2015) seasonal definitions in this assessment.
2.4	Apportionment	Clarification of aspects of breeding season	This aspect is relevant to assessment of effects on individual Special Protection

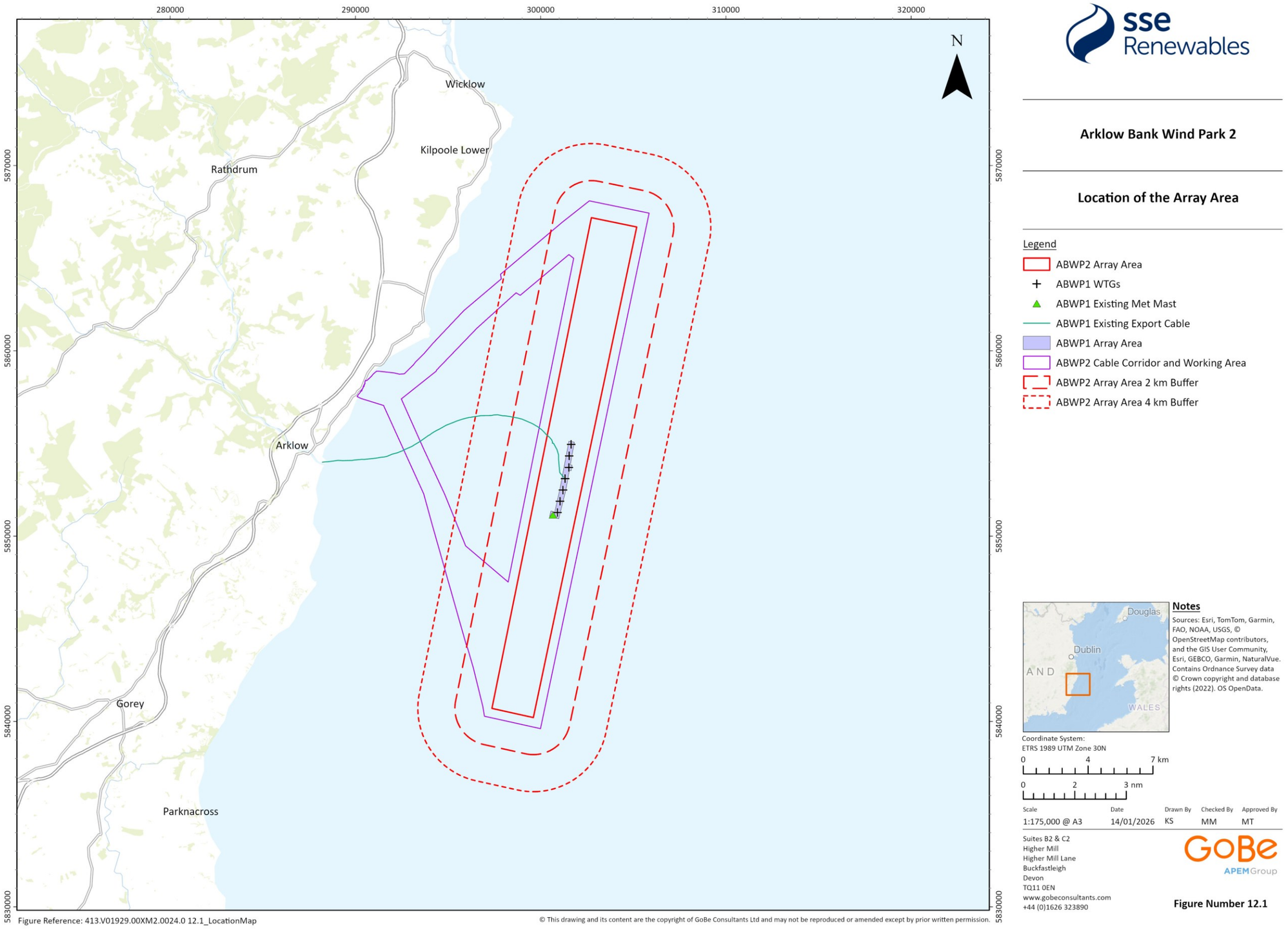
Review section heading	Topic	Summary of review comment	The Developer response and section where provision is addressed (if appropriate)
		definitions, population sizes and apportioning methods.	Areas (SPAs) provided in the Natura Impact Statement (where these comments are considered further)
2.6	Migratory non-seabirds and seabirds	Use of the SOSS approach may be replaced when the results of work commissioned by Marine Scotland is available.	The Marine Scotland work was to review and update the SOSS methods, not replace them. Preliminary results indicate the two methods are largely the same, however the new tools are not currently available or endorsed for use in the UK, therefore the SOSS tool remains the most appropriate option.
3	Responses to questions	Further explanation for rationale for species included in or omitted from the CRM	This has been provided in sections 12.9.8, 12.9.9 and 12.9.10.
		Further review and consideration of parameters used in the CRM (e.g. flight speed)	This has been provided in sections 12.9.8, 12.9.9 and 12.9.10.
		Further information is necessary to establish whether the displacement risk species and parameters are reasonable.	This has been provided in section 12.9.2.

12.4 Study area

12.4.1.1 The Offshore Ornithology Study Area was defined through consideration of potential impacts on offshore ornithological receptors and the suitability of this area for the purpose of EIAR. The Offshore Ornithology Study Area was consulted through consultation with the NPWS. It is not considered feasible or realistic to define a precise Study Area appropriate to all ornithological receptors which may have connectivity to the Proposed Development. Instead this has been defined in approximate geographical terms as the Irish Sea and adjoining marine area (and seabird colonies therein) that are understood from studies of different seabird species' ecology and movement patterns to have some degree of connectivity with the Proposed Development. For example, a proportion of the gannet which breed at colonies along the west coast of Scotland are expected to pass through the Irish Sea on migration in spring and autumn, and therefore connectivity would be assumed. However, other species which may breed at the same Scottish colonies, such as herring gull, would not be expected to travel such distances or have any appreciable connectivity.

12.4.1.2 The Offshore Ornithology Study Area includes the Array Area surrounded by a 2 km and a 4 km buffer (Figure 12.1). The Cumulative Offshore Ornithology Study Area includes all offshore windfarm projects around Ireland and the UK (primarily focussed on the Irish Sea) where effect-receptor pathways with the Proposed Development have been assumed present. This included operational and consented offshore windfarms, those in the planning phase for which suitable data were available in the public domain, or for which the data were provided by those projects for use in the assessment.

12.4.1.3 The Intertidal Ornithology Study Area (Volume III, Appendix 12.11: Offshore Ornithology Technical Report - Arklow Bank Wind Park 2 Onshore Cable Corridor and Landfall Baseline Bird Survey) includes the total area of inshore waters that could be seen from Vantage Points (VPs) located onshore to provide views of the area of sea and adjacent intertidal land at the landfall location (Volume III, Appendix 12.11: Offshore Ornithology Arklow Bank Wind Park 2 Onshore Cable Corridor and Landfall Baseline Bird Survey, Figure 1).



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Figure 12.1: Study Area including the Array Area surrounded by a 2 km and a 4 km buffer

12.5 Methodology

12.5.1 Methodology to inform the baseline

Desktop studies

12.5.1.1 Information on seabird ecology and distribution within the Offshore Ornithology Study Area as well as potential impacts of windfarms on seabirds was collected through a detailed desktop review of existing studies and datasets.

12.5.1.2 The desk-based assessment has drawn on a wide variety of published literature, covering both peer reviewed scientific literature and the 'grey literature' such as windfarm project submissions and reports. The key topics for which the literature has been examined are summarised at Table 12.4 below.

Table 12.4: Summary of key desktop reports and data resources

Title	Source	Year	Author
Relevant literature on population sizes, migration routes and foraging ranges			
Seabird Populations of Britain and Ireland	T. and A.D. Poyser, London	2004	Mitchell *et al.*
Nonbreeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS)	Natural England Commissioned Report Number 164. 389 pp	2015	Furness
Birds in Europe: population estimates, trends and conservation status	Birdlife Conservation Series No. 12. Cambridge, UK.	2004	BirdLife International
Population estimates on birds in Great Britain and the United Kingdom	British Birds, 106, 64–100	2013	Musgrove *et al.*
Waterbirds in the UK 2022/23: The Wetland Bird Survey	Available at: https://www.bto.org/our-work/science/publications/reports/waterbirds-uk/2022-23	2024	Woodward *et al.*
Desk-based revision of seabird foraging ranges used for Habitats Regulations Assessment (HRA) screening	BTO Report 724 for The Crown Estate	2019	Woodward *et al.*
Foraging ranges of northern gannets *Morus bassanus* in	Report to the Department of Energy and Climate Change (DECC).	2010	Langston *et al.*

Title	Source	Year	Author
relation to proposed offshore windfarms in the UK: 2010-2012	Reference DECC URN:13D/306		
The Birds of the Western Palearctic	Oxford University Press, Oxford	1977 - 1994	Cramp and Simmons
Handbook of the Birds of the World	Lynx Editions, Madrid	1992 - 2011	Del Hoyo *et al.*
An atlas of seabird distribution in north-west European waters	Joint Nature Conservation Committee (JNCC), Peterborough	1995	Stone *et al.*
Birds in Ireland	T and AD Poyser, London	2010	Hutchinson
The Migration Atlas: Movements of the birds of Britain and Ireland.	T and AD Poyser, London	2002	Wernham *et al.*
Seabird Population Trends and Causes of Change: 1986-2018 Report	https://jncc.gov.uk/our-work/smp-report-1986-2018 JNCC, Peterborough	2020	JNCC
Effects of offshore windfarms on the energy demands of seabirds	University of Aberdeen report to the Department of Energy and Climate Change	2009	Speakman *et al.*
ObSERVE aerial seabird survey data collected between 2015 and 2016 across all Exclusive Economic Zone (EEZ) waters surrounding the Republic of Ireland	Available at: https://www.dccae.gov.ie/en-ie/natural-resources/topics/Oil-Gas-Exploration-Production/observe-programme/Pages/ObSERVE-Programme.aspx	2016	Jessopp *et al.*
ObSERVE 2 aerial seabird survey data collected between 2021 and 2023 across all Exclusive Economic Zone (EEZ) waters surrounding the Republic of Ireland	Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2021-2023. Department of the Environment, Climate & Communications and Department of Housing, Local Government & Heritage, Ireland. 260pp	2024	Giralt Paradell *et al.*

Title	Source	Year	Author
Assessing the impacts of windfarms on birds	Ibis, 148 (Suppl. 1), 4-7	2006	Drewitt and Langston
Trapped within the corridor of the southern North Sea: the potential impact of offshore windfarms on seabirds	Birds and Windfarms. de Lucas, M., Janss, G.F.E. and Ferrer, M. (Eds). Quercus, Madrid	2007	Stienen *et al.*
Vulnerability of Scottish seabirds to offshore wind turbines	Report to Marine Scotland	2012	Furness and Wade
Rare breeding birds in the United Kingdom in 2009	British Birds, 104, 476–537	2011	Holling *et al.*
An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine Special Protection Area (SPAs)	JNCC Report, No. 431. JNCC, Peterborough	2010	Kober *et al.*
Seabirds Count: a census of breeding seabirds in Britain and Ireland (2015–2021)	Lynx Nature Books, Barcelona	2023	Burnell *et al.*
The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018	Irish Wildlife Manuals, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland	2019	Cummins *et al.*
Relevant literature on collision risk, flight heights and avoidance rates			
Using a collision risk model to assess bird collision risks for offshore windfarms	The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02	2012	Band
Assessing the risk of offshore windfarm development to migratory birds designated as features of UK Special Protection Area (and other Annex I species)	Strategic Ornithological Support Services. Project SOSS-05. BTO Research Report No. 592.	2012	Wright *et al.*
Modelling flight heights of marine birds to more accurately assess	Journal of Applied Ecology, 51, 31-41	2014a	Johnston *et al.*

Title	Source	Year	Author
collision risk with offshore wind turbines			
Corrigendum	Journal of Applied Ecology, 51, doi: 10.1111/1365-2664.12260	2014b	Johnston *et al.*
The Avoidance Rates of Collision Between Birds and Offshore Turbines	Scottish Marine and Freshwater Science Volume 5 Number 16. Available at: http://www.gov.scot/resource/0046/00464979.pdf	2014	Cook *et al.*
Strategic assessment of collision risk of Scottish offshore windfarms to migrating birds	Scottish Marine and Freshwater Science Report Vol 5 No 12	2013	Wildfowl and Wetlands Trust (WWT Consulting) Ltd and MacArthur Green
Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review		2014	Statutory Nature Conservation Bodies (SNCBs): Natural Resources Wales (NRW), Natural England, Northern Ireland Environment Agency (NIEA), JNCC and Scottish Natural Heritage (SNH)
Joint advice note from the Statutory Nature Conservation Bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments		2024	Statutory Nature Conservation Bodies (SNCBs): Natural Resources Wales (NRW), Natural England, Northern Ireland Environment Agency (NIEA), JNCC and Scottish Natural Heritage (SNH)
Relevant literature on disturbance and displacement			
Interim Displacement Advice Note	Available at: https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/joint-sncb-interim-displacement-advice-note-2022.pdf	2017 (updated 2022)	SNCBs: Natural Resources Wales (NRW), Department of Agriculture, Environment and Rural Affairs / Northern Ireland Environment Agency

Title	Source	Year	Author
			(DAERA/NIEA), Natural England, Scottish Natural Heritage (SNH) and Joint Nature Conservation Committee (JNCC) Joint SNCB
Displacement Note: Joint Natural England and JNCC Interim Advice Note: Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments		2012	Natural England and JNCC
Scaling possible adverse effects of marine windfarms on seabirds: developing and applying a vulnerability index	Journal of Applied Ecology, 41, 724-734	2004	Garthe and Hüppop
Assessing vulnerability of marine bird populations to offshore windfarms	Journal of Environmental Management, 119, 56-66	2013	Furness *et al.*
Mapping Seabird Sensitivity to Offshore Wind Farms	PLoS ONE. 9(9): e106366	2014	Bradbury *et al.*
Desk-based revision of seabird foraging ranges used for HRA screening. Report by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate	BTO Research Report No. 724, 139pp	2019	Woodward *et al.*
Seabirds: displacement	In: Perrow, M.R. (ed). Wildlife and Wind Farms, Conflicts and Solutions Volume 3 Offshore: Potential Effects. Pelagic Publishing, Exeter, UK: pp. 174–205.	2019	Vanermen and Stienen
Seabirds and offshore wind farms – Displacement monitoring 2.0.	In Environmental impacts of offshore wind farms in the Belgian part of the North Sea: Progressive insights in changing species	2023	Vanermen *et al.*

Title	Source	Year	Author
	distribution patterns informing marine management (pp. 85-101)		
Effects of offshore wind-farms on seabird abundance: strong effects in spring and in the breeding season	Mar Environ Res 62:105157. https://doi.org/10.1016/j.marenvres.2020.105157	2020	Peschko *et al.*
A synthetic analysis of post-construction displacement and attraction of marine birds at offshore wind energy installations	Environmental Impact Assessment Review, Volume 108	2024	Lamb *et al.*
Seabirds and offshore wind farms in European waters: avoidance and attraction.	Biol. Conserv. 202, 59–68	2016	Dierschke *et al.*
Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments	Marine Policy 70: 108–113	2016	Wade *et al.*
A new method for quantifying redistribution of seabirds within operational offshore wind farms finds no evidence of within-wind farm displacement	Front. Mar. Sci. 11:1235061. doi: 10.3389/fmars.2024.1235066	2024	Trinder *et al.*

Site-specific surveys

12.5.1.3 In order to inform the EIAR, site-specific surveys were undertaken. A summary of the surveys used to inform the offshore ornithology impact assessment is outlined in Table 12.5 below.

Table 12.5: Site specific surveys

Data source	Date(s) of survey	Overview of survey	Survey contractor	Reference to further information
Digital aerial ornithology survey	March 2018 to April 2020 (monthly); August 2023 to June 2024; February to July 2025	Offshore aerial surveys undertaken over a period of 43 months to assess the temporal and spatial	HiDef Aerial Surveying Limited. Bird surveyors were: • Richard Schofield: European Seabirds at Sea (ESAS) certified, over 40	Volume III, Appendix 12.1: Offshore Ornithology Technical Report – Overview

Data source	Date(s) of survey	Overview of survey	Survey contractor	Reference to further information
		abundance and distribution of birds	years ornithological technical expertise; • Pete Ullrich: over 10 years ornithology surveying of UK offshore windfarm sites and 40 years ornithological technical expertise; • Micky Maher: over 15 years undertaking work for the RSPB, JNCC, NatureScot, National Trust and Scottish Wildlife Trusts, authored several bird identification scientific papers;	(Revised March 2026)
Kittiwake flight height surveys	September 2025 – January 2026	Boat based surveys of the ABWP2 Array Area to record kittiwake flight height	APEM	Volume III, Appendix 12.17: Offshore Ornithology Technical Report - Kittiwake Flight Height Survey Report (Revised March 2026)
Shore bird survey of candidate Cable Corridor and Working Area landfall locations	November 2019 to March 2020	Baseline survey to assess the bird species likely to occur in the area during the winter period. Potential breeding habitat for seabirds was also assessed.	Dixon Brosnan	Volume III, Appendix 12.11 Onshore Cable Route and Landfall Baseline Bird Survey
Vantage Point Surveys	September – November 2025	Weekly Vantage Point (VP) surveys at Wicklow Head and Kilmichael Point, comprising a	APEM	Volume III, Appendix 12.20: Offshore Ornithology Technical Report - Migratory Bird

Data source	Date(s) of survey	Overview of survey	Survey contractor	Reference to further information
		six-hour watch at each location		Survey Report (RFI March 2026)
Passive Acoustic Monitoring	September – November 2025	Capturing of nocturnal acoustic data onshore and offshore (at Wicklow Head and 2 locations with the Array Area).	APEM	Volume III, Appendix 12.20: Offshore Ornithology Technical Report - Migratory Bird Survey Report (RFI March 2026
Wicklow Head Surveys	2023 - 2025	Annual surveys of the Wicklow Head kittiwake colonies including seabird census, colony count, disturbance and productivity	APEM	Volume III, Appendix 12.16: Offshore Ornithology Technical Report - Wicklow Head Seabird Monitoring (RFI March 2026)
Tracking of Black-legged kittiwake distribution in the Irish Sea	2024 and 2025	GPS and geolocator studies of breeding adult kittiwake at Wicklow Head SPA	UCC	Volume III, Appendix 12.18: Offshore Ornithology Technical Report - Kittiwake Tracking Report (RFI March 2026)

Potential change in baseline due to proposed decommissioning of ABWP1

12.5.1.4 The seven wind turbines which comprise ABWP1 are not currently operational (Q1 2026) and it is understood that pre-application consultation to decommission the turbines has commenced. Since these turbines were present during all of the baseline surveys (Table 12.5), their removal may result in a modification to the estimated baseline (i.e. densities and abundance) for some species. If the removal of any influence from the ABWP1 turbines is not accounted for in the estimation of effects from the ABWP2 turbines this would potentially amount to double-counting (e.g. a bird cannot be displaced twice: once as recorded in the baseline and once through the ABWP2 impact assessment), albeit the degree of doubling up such effects would be small, given the small size of ABWP1. While the extent of such effects are difficult to quantify, consideration has been given to this potential in the appropriate sections of the assessment.

12.5.1.5 Collison risks for kittiwake are presented with and without estimated risks at ABWP1 since this species is considered at risk of collisions and breeds at the nearby Wicklow Head SPA colony. It was not considered necessary to take this approach for other species at risk of collisions since

the numbers involved were much lower and hence of lower concern. Nonetheless, if the ABWP1 turbines are fully decommissioned, any impacts due to those turbines could also be discounted from that for ABWP2.

Identification of designated sites

12.5.1.6 All designated sites within the offshore ornithology Study Area (see section 12.3.1 for how this has been defined) and the qualifying interests that could be affected by the construction, operational and maintenance, and decommissioning phases of the Proposed Development were identified using the three-step process described below:

- Step 1: All designated sites of international, national and local importance within the offshore ornithology Study Area were identified using a number of sources. These included the Environmental Protection Agency (EPA) and NPWS websites, as well as UK sources of similar information.
- Step 2: Information was compiled on the relevant qualifying interest for each of these sites which may make them a sensitive receptor in terms of offshore ornithology. For example, risk of collisions with rotating turbines.
- Step 3: Using the above information and expert judgement, sites were included for further consideration if:
  - A designated site directly overlaps with the Proposed Development; or
  - Sites and associated qualifying interests were located within the potential Zone of Influence (ZoI) for impacts associated with the Proposed Development. Note that, as discussed above (Section 12.4) the ZoI has not been defined in strict distance terms but rather on a species-specific basis and taking into account seabird movement patterns.

Table 12.6: Designated sites and relevant qualifying interests for the offshore ornithology

Designated Site	Closest Distance to the Array Area (km)	Closest Distance to the Cable Corridor and Working Area (km)	Relevant Qualifying Interest
Wicklow Head SPA	6.0	5.2	Kittiwake (Rissa tridactyla)
The Murrough SPA*	8.0	12.9	Little tern (*Sterna albifrons*) , Red-throated diver (*Gavia stellata*)
The Raven SPA	34.3	33.8	Little tern
Dalkey Islands SPA	40.2	39.3	Arctic tern (*Sterna paradisaea)* Common tern (*Sterna hirundo*) Roseate tern (Sterna dougallii)
Wexford Harbour and Slobs SPA	41.6	41	Cormorant (*Phalacrocorax carbo*) Lesser black-backed gull (*Larus fuscus*) Little tern
South Dublin Bay and River Tolka Estuary SPA	44.5	43.6	Arctic tern Black-headed gull (*Chroicocephalus ridibundus*) Common tern Roseate tern
North-West Irish Sea cSPA	47.1	52.1	Common scoter (*Melanitta nigra*)

Designated Site	Closest Distance to the Array Area (km)	Closest Distance to the Cable Corridor and Working Area (km)	Relevant Qualifying Interest
			Red-throated diver (*Gavia stellata*) Great Northern diver (*Gavia immer)* Fulmar (*Fulmarus glacialis*) Manx shearwater (*Puffinus puffinus*) Shag (*Gulosus aristotelis*) Cormorant Little gull (*Larus minutus*) Kittiwake Black-headed gull Common gull (*Larus canus*) Lesser black-backed gull Herring gull Great black-backed gull (*Larus marinus*) Little tern Roseate tern Common tern Arctic tern Puffin (*Fratercula arctica*) Razorbill Guillemot
Howth Head Coast SPA	49.6	48.6	Kittiwake
Ireland's Eye SPA	53.7	52.8	Cormorant Guillemot (*Uria aalge*) Herring gull (*Larus argentatus*) Kittiwake Razorbill (*Alca torda*)
Lady's Island Lake SPA	57.7	57.1	Arctic tern Black-headed gull Common tern Roseate tern Sandwich tern (Sterna sandvicensis)
Lambay Island SPA	62.5	61.6	Cormorant Fulmar Guillemot Herring gull Kittiwake Lesser black-backed gull Puffin Razorbill Shag
Aberdaron Coast and Bardsey Island / Glannau Aberdaron and Ynys Enlli SPA	65.9	65.4	manx shearwater
Saltee Islands SPA	70.9	70.4	Cormorant Fulmar Gannet (*Morus bassanus*)

Designated Site	Closest Distance to the Array Area (km)	Closest Distance to the Cable Corridor and Working Area (km)	Relevant Qualifying Interest
			Guillemot Herring gull Kittiwake Lesser black-backed gull Puffin Razorbill Shag
Rockabill SPA	71.9	71	Arctic tern Common tern Roseate tern
Keeragh Islands SPA	72.9	72.3	Cormorant
Skerries Island SPA	73.0	72	Cormorant Herring gull Shag
Seas off Wexford cSPA	74.9	86.2	Red-throated Diver Fulmar Manx Shearwater Gannet Cormorant Shag Common Scoter Mediterranean Gull Black-headed Gull Lesser Black-backed Gull Herring Gull Kittiwake Sandwich Tern Roseate Tern Common Tern Arctic Tern Little Tern Guillemot Razorbill Puffin
Anglesey Terns / Morwenoliaid Ynys Môn SPA	82.5	81.6	Arctic tern Common tern Roseate tern Sandwich tern
River Nanny Estuary and Shore SPA	83.7	82.7	Herring gull
Boyne Estuary SPA	91.5	90.6	Little tern
Irish Sea Front SPA	93.9	92.9	Manx shearwater
North Cardigan Bay SPA	99.0	98.5	Red-throated diver
Grassholm SPA	107.6	107	Gannet

** Note that these distances have been measured from the seaward boundary of the Murrough SPA which has been extended although the statutory instrument has not been revised correspondingly (https://experience.arcgis.com/experience/edf34d92e28040fd87d3d14f55d8d95f and https://www.npws.ie/protected-sites/spa/004186).*

12.5.2 Baseline environment

Important Ecological Features

SPECIES RECORDED IN THE OFFSHORE ORNITHOLOGY STUDY AREA

12.5.2.1 A technical report has been prepared to provide a detailed characterisation of the receiving baseline (Volume III, Appendix 12.1: Offshore Ornithology Technical Report - Overview (Revised March 2026)). A review of the key findings from that study has been incorporated into the description of the receiving environment.

12.5.2.2 The following bird species (Table 12.7) were recorded during digital aerial surveys within the Array Area as well as within the Array Area 2 km and 4 km buffers.

Table 12.7: Bird species recorded during digital aerial surveys within the Array Area, the 2 km buffer and the 4 km buffer

Species	Array Area	2 km buffer	4 km buffer
Arctic skua			X
Arctic tern	X	X	X
Black headed gull	X	X	X
Common gull	X	X	X
Common scoter	X	X	X
Common tern	X	X	X
Cormorant	X	X	X
Fulmar	X	X	X
Gannet	X	X	X
Great black-backed gull	X	X	X
Great northern diver	X	X	X
Guillemot	X	X	X
Herring gull	X	X	X
Kittiwake	X	X	X
Lesser black-backed gull	X	X	X
Little gull	X	X	X
Manx shearwater	X	X	X

Species	Array Area	2 km buffer	4 km buffer
Mediterranean gull	X	X	X
Pomarine skua			X
Puffin	X	X	X
Razorbill	X	X	X
Red-throated diver	X	X	X
Roseate tern		X	X
Sandwich tern	X	X	X
Shag	X	X	X
Storm petrel	X	X	X

SEASONAL BIRD ABUNDANCE

12.5.2.3 Bird abundances and assemblages have been estimated from the site-specific surveys carried out for the Proposed Development. These abundance estimates and how they were estimated are presented in detail in Volume III, Appendix 12.1: Offshore Ornithology Technical Report - Overview (Revised March 2026) and Volume III, Appendix 12.3: Offshore Ornithology Technical Report - Monthly Seabird Abundance (Revised March 2026) and are not repeated here.

12.5.2.4 Impacts have been assessed for each species recorded from the site-specific surveys in relation to relevant biological seasons (Table 12.8) as defined by Furness (2015).

12.5.2.5 The seasonal definitions in Furness (2015) include overlapping months in some instances due to variation in the timing of migration for birds which breed at different latitudes (i.e. individuals from breeding sites in the north of the species' range may still be on spring migration when individuals farther south have already commenced breeding). Note that for the latter, where months contain overlapping seasons (for example breeding and migration), these have been assigned to breeding, since for almost all species, the Array Area is located within species-specific foraging ranges (refer to Woodward *et al.*, 2019) of breeding colonies. The exceptions to this are Arctic tern, common tern, Sandwich tern and razorbill colonies which are beyond foraging distance of the Proposed Development.

Table 12.8: Species-specific seasonal definitions have been taken from Furness (2015) and Snow and Perrins (1998). Shaded cells indicate the appropriate nonbreeding season periods used in the assessment for each species.

Species	Breeding	Migration - autumn	Winter	Migration – spring	Nonbreeding
Arctic skua	May-Jul	Aug-Oct	-	Apr-May	-
Arctic tern	May-Aug	Jul-Sep	-	Apr-May	-
Black-headed gull[a]	May-Aug	-	-		Sep-Apr
Common gull[a]	May-Aug	-	-	-	Sep-Apr

Species	Breeding	Migration - autumn	Winter	Migration – spring	Nonbreeding
Common scoter[a]	May-Aug	Sep-Dec	-	Feb-May	-
Common tern	May-Aug	Jul-Sep	-	Apr-May	-
Cormorant	Apr-Aug	Aug-Oct	-	Feb-Apr	Sep-Mar
Fulmar	Jan-Aug	Sep-Oct	Nov	Dec-Mar	-
Gannet	Mar-Sep	Sep-Nov	-	Dec-Mar	-
Great black-backed gull	Mar-Aug	Aug-Nov	Dec	Jan-Apr	Sep-Mar
Great northern diver	-	Sep-Nov	Dec-Feb	Mar-May	Sep-May
Guillemot	Mar-Jul	Jul-Oct	Nov	Dec-Feb	Aug-Feb
Herring gull	Mar-Aug	Aug-Nov	Dec	Jan-Apr	Sep-Feb
Kittiwake[b]	Apr-Aug	Sep-Dec	-	Jan-Mar	-
Lesser black-backed gull	Apr-Aug	Aug-Oct	Nov-Feb	Mar-Apr	-
Little gull[a]	Apr-Jul	-	-	-	Aug-Apr
Manx shearwater	Apr-Aug	Aug-early Oct	Nov-Feb	Mar-May	Sept-Mar
Puffin	Apr-Aug	Jul-Aug	Sep-Feb	Mar-Apr	Mid-Aug-Mar
Razorbill	Apr-Jul	Aug-Oct	Nov-Dec	Jan-Mar	-
Red-throated diver	Mar-Aug	Sep-Nov	Dec-Jan	Feb-Apr	-
Sandwich tern	Apr-Aug	Jul-Sep	-	Mar-May	Sep-Mar
Shag	Feb-Aug	Aug-Oct	Nov	Dec-Feb	Sep-Jan

a Not included in Furness (2015). Seasons taken from the Birds of the Western Palearctic (Snow and Perrins 1998).

b *https://www.nature.scot/sites/default/files/2018-11/Guidance%20-%20Suggested%20seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment.pdf*

12.5.2.6 The seasonal peak abundance within species-specific seasons (as defined in Table 12.8) calculated individually for seabirds recorded within the Array Area are provided in Table 12.9 (note these abundances do not include birds observed in the 2 km or 4 km buffer around the Array Area).

12.5.2.7 The method used to calculate the seasonal peaks for the Proposed Development was as follows:

- The population density and abundance for each survey was calculated using design-based estimation methods, with 95% confidence intervals calculated using non-parametric bootstrapping (this is a standard statistical method for estimating uncertainty by randomly resampling from a dataset to obtain multiple replicate versions of the data; see Volume III, Appendix 12.1: Offshore Ornithology Technical Report – Overview (Revised March 2026) for further details); and
- The abundance for each calendar month was calculated as the mean of estimates for each month (i.e. this was the average of two values for all months with the exception of July, for which three surveys were conducted).

12.5.2.8 The seasonal peak was taken as the highest of the monthly estimates from those months which fall within each season. In some cases, the peak was recorded in a month which is included in overlapping seasons (e.g. for some species March or April is identified as both a migration month and a breeding month, as noted in section 12.5.2.5) and therefore the same value has been reported in both seasons. These have been highlighted in italics in Table 12.9. The migration-free breeding season comprises months when all breeding individuals of that species are considered to be at breeding colonies and not on migration. For example, in the case of gannet, the full breeding season covers March to September, but as March is also included in the spring migration period and September in the autumn migration period, the migration-free months are April to August.

12.5.2.9 A summary of the observations for each species within the Array Area is provided in Volume III, Appendix 12.1: Offshore Ornithology Technical Report – Overview (Revised March 2026).

12.5.2.10 Note that some species, such as skuas, terns and little gull are likely to be poorly represented in the survey data (e.g. due to infrequent passage movements) and therefore the impact assessments for these species draw on additional sources of information with regards their anticipated movements and utilise methods developed for migratory species (e.g. Wildfowl and Wetlands Trust (WWT) and MacArthur Green, 2013).

Table 12.9: Seasonal peak population and 95% confidence intervals within the Array Area (not including buffer). The population size (including birds in flight and on the water) in each calendar month was calculated as the mean of the individual surveys conducted in that month and the values shown in the table are the highest from all months in each season. Numbers in italics identify occasions when the same peak was recorded in different seasons due to overlapping months

Species	Breeding (full period)		Breeding (migration – free)		Migration - autumn		Winter		Migration – spring		Nonbreeding	
	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.
Arctic skua	0	0-0	0	0-0	0	0-0	-	-	0	0-0	-	
Arctic tern	*1,076.7*	*363.3-2093.9*	0	0-0	*1,076.7*	*363.3-2093.9*	-	-	190	39.9-413.4	-	-
Black-headed gull	3.3	0-10	3.3	0-10	-	-	-	-			560	106.7-1,103.5
Common gull	*15*	*0-45*	*15*	*0-45*	-	-	-	-	-	-	1220	159.9-3050.2
Common scoter	10	0-30	-	-	-	-	-	-	-	-	13.3	0-36.7
Common tern	*300*	*140-513.3*	0	0-0	*300*	*140-513.3*	-	-	73.3	0-200	-	-
Cormorant	0	0-0	-	-	-	-	-	-	-	-	10	0-30
Fulmar	*3.3*	*0-10*	*3.3*	*0-10*	5	0-15	0	0-0	0	0-0	-	-
Gannet	*45*	*2.5-120*	*45*	*2.5-120*	36.7	3.3-83.3	-	-	20	0-50	-	-
Great black-backed gull	0	0-0	0	0-0	3.3	0-10	3.3	0-10	10	0-25	10	0-30

Species	Breeding (full period)		Breeding (migration – free)		Migration - autumn		Winter		Migration – spring		Nonbreeding	
	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.
Great northern diver	-	-	-	-	0	0-0	*10*	*0-30*	0	0-0	*10*	*0-30*
Guillemot	*4230.3*	*973.6-9212.0*	*4230.3*	*973.6-9212.0*	1266.4	746.5-1914.6	1346.5	635.7-2316.0	*3298.2*	*1828.7-5149.2*	*3298.2*	*1828.7-5149.2*
Herring gull	*5*	*0-12.5*	*5*	*0-12.5*	*10*	*0-26.7*	0	0-0	5	0-17.5	*10*	*0-26.7*
Kittiwake	3077.5	1487.3-5222.8	477.5	165-940.2	2166.7	316.7-4714.7	-	-	4002.5	1524.3-6885.9	-	-
Lesser black-backed gull	0	0-0	0	0-0	0	0-0	0	0-0	7.5	0-20	-	-
Little gull	25	0-65	0	0-0	-	-	-	-	-	-	1,140	226.7-2313.7
Manx shearwater	*520*	*82.5-1140.2*	292.5	65-615.1	*520*	*82.5-1140.2*	0	0-0	287.5	12.5-770.1	93.3	3.3-283.3
Puffin	*5*	*0-15*	*5*	*0-15*	5	0-15	10	0-30	*20*	*0-50*	*20*	*0-50*
Razorbill	*207.8*	*90.4-364.5*	*207.8*	*90.4-364.5*	804.2	273.9-1623.6	2204.8	610.4-4390.9	2975.9	1353.0-5205.3	-	-
Red-throated diver	127.5	32.5-257.6	56.7	13.3-113.4	40	3.3-36.7	163.3	60-300	127.5	32.5-195.1	-	-
Sandwich tern	5	0-15	0	0-0	*10*	*0-23.3*	-	-	5	0-15	*10*	*0-23.3*

Species	Breeding (full period)		Breeding (migration – free)		Migration - autumn		Winter		Migration – spring		Nonbreeding	
	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.	Peak	95% c.i.
Shag	*57.5*	*5-132.5*	50	6.7-120	16.7	0-43.3	16.7	0-43.3	*57.5*	*5-132.5*	46.7	10-100

Nature conservation value

12.5.2.11 Species included in the impact assessment are those which were recorded during surveys and which are considered to be at potential risk from the Proposed Development either due to their abundance, potential sensitivity to windfarm impacts or due to biological characteristics which make them potentially susceptible (e.g. commonly fly at rotor height). The conservation status of each assessed species is provided in Table 12.10 based on the Birds of Conservation Concern in Ireland (BoCCI) criteria in Gilbert *et al.* (2021). The locations of all species observed are shown in Volume III, Appendix 12.8: Offshore Ornithology Technical Report – Seabird Spatial Distribution Maps (Revised March 2026).

Table 12.10: Summary of nature conservation value of species considered at potential risk of impacts

Species	Conservation status
Arctic skua	BoCCI Green listed, Birds Directive Migratory Species
Arctic tern	BoCCI Amber listed, Birds Directive Migratory Species, Birds Directive Annex 1
Black-headed gull	BoCCI Amber listed, Birds Directive Migratory Species
Common gull	BoCCI Amber listed, Birds Directive Migratory Species
Common scoter	BoCCI Red listed, Birds Directive Migratory Species
Common tern	BoCCI Amber listed, Birds Directive Migratory Species, Birds Directive Annex 1
Cormorant	BoCCI Amber listed, Birds Directive Migratory Species
Fulmar	BoCCI Amber listed, Birds Directive Migratory Species
Gannet	BoCCI Amber listed, Birds Directive Migratory Species
Great black-backed gull	BoCCI Green listed, Birds Directive Migratory Species
Great northern diver	BoCCI Amber listed, Birds Directive Migratory Species, Birds Directive Annex 1
Guillemot	BoCCI Amber listed, Birds Directive Migratory Species
Herring gull	BoCCI Amber listed, Birds Directive Migratory Species
Kittiwake	BoCCI Red listed, Birds Directive Migratory Species
Lesser black-backed gull	BoCCI Amber listed, Birds Directive Migratory Species
Little gull	BoCCI Amber listed, Birds Directive Migratory Species
Manx shearwater	BoCCI Amber listed, Birds Directive Migratory Species
Puffin	BoCCI Red listed, Birds Directive Migratory Species

Species	Conservation status
Razorbill	BoCCI Red listed, Birds Directive Migratory Species
Red-throated diver	BoCCI Amber listed, Birds Directive Migratory Species, Birds Directive Annex 1
Sandwich tern	BoCCI Amber listed, Birds Directive Migratory Species, Birds Directive Annex 1
Shag	BoCCI Amber listed, Birds Directive Migratory Species

Reference breeding populations

12.5.2.12 For the breeding period, the population size for each species assessed was estimated by first summing the number of breeding adults at colonies with potential connectivity to the Proposed Development (this followed UK SNCB guidance and assumed connectivity distances as the mean maximum foraging range plus one standard deviation, as set out in the Phase 1 Joint Method Statement). Foraging ranges were taken from Woodward et al. (2019) and colony counts from Cummins et al. (2019) and Burnell et al. (2023). The full list of colonies and counts is provided in Volume III, Appendix 12.15: Offshore Ornithology Technical Report - Seabird Breeding Reference Populations (RFI March 2026).

12.5.2.13 As the above total only comprises adult breeding birds, it was also necessary to estimate the number of immature birds also present in the region. These is a degree of uncertainty in how many immature birds will be present in the breeding season, therefore two different approaches to estimating this number were applied, resulting in two alternative reference populations against which impacts were assessed.

12.5.2.14 The first method used the estimate of the adult percentage of the population derived from demographic rates (obtained from the literature, see Table 12.14) to calculate the complementary number of immature birds: dividing the adult population by the estimate of their proportion gives the total population for all age classes. For example, the adult kittiwake population within foraging range was 70,748. The adult proportion for this species is 52.7%, therefore the total, all ages, population would be 70,748/0.527 = 134,280 individuals.

12.5.2.15 The second approach makes the assumption that immature birds present during the preceding nonbreeding season (i.e. the spring, winter or nonbreeding season, depending on the species, see Furness 2015) will remain in the region during the following breeding season, since they are not tied to a colony. Thus, the immature component of the preceding BDMPS was added to the breeding adult total (estimated above). For example, the Furness (2015) spring kittiwake BDMPS that includes the Irish Sea is 691,526, made up of 375,711 adults and 315,815 immatures. The number of adults estimated to be within foraging range was 70,748. Therefore including the remaining immature birds (315,815) this gives an all age population in the breeding season of 386,563.

12.5.2.16 These two breeding season estimates allow for uncertainty in the population at risk to be incorporated into the assessments (Table 12.11). Where relevant these have also taken account of the timing of migration (i.e. to give consideration to overlapping breeding and migration months) and the other populations that may be passing through, and also to the potential presence of nonbreeding individuals (e.g. including immature and juvenile birds, failed breeders and individuals on ‘sabbatical’, i.e. those taking a break from breeding). Since the relevant breeding season reference populations are dependent on varying combinations of these different factors, they have not been defined here, but are considered in the relevant sections of the impact assessment for each species.

Reference nonbreeding populations

12.5.2.17 For the nonbreeding period, the population estimates have been calculated using the seasons and regions defined by Furness (2015), with adjustment to incorporate up to date Irish counts (e.g. Cummins *et al.* 2019). This was achieved by first removing the Irish components from the Furness (2015) figures, then estimating the values for Irish colonies derived from recent surveys (Cummins *et al.* 2019) and adding these back on to obtain figures for the Irish Sea which explicitly include connectivity with colonies in both the UK and Ireland (Table 12.11).

Table 12.11: BDMPS Breeding season populations (all age classes). Column 1 provides the adults within foraging range, column 2 the adult proportion of the population (from Furness 2015), column 3 the estimate of immatures in the population (derived from columns 1 and 2), column 4 is the number of immatures reported to be present in the preceding season (from Furness 2015), column 5 provides the method 1 breeding season populations (the sum of columns 1 and 3; the all ages total population) and column 6 provides the method 2 breeding season population (the sum of column 1 and column 4).

Species	Breeding adults within foraging range (Burnell et al. 2023; Woodward et al. 2019)	Adult proportion (Furness 2015)	Immatures estimated from adults x (1-adult proportion)	Immatures in previous season BDMPS	BDMPS reference populations used in the assessment	
					Breeding (adults plus estimated immatures)	Breeding (colony counts plus immatures from previous BDMPS season)
Arctic tern	22	0.63	13	22,882	35	22,904
Common tern	1,018	0.60	679	24,442	1697	25,460
Cormorant	124	0.46	146	5,378	270	5,502
Fulmar	7,484	0.62	4,587	338,153	12071	345,637
Gannet	238,718	0.55	195,315	270,348	434033	509,066
Great black-backed gull	982	0.44	1,250	12,120	2232	13,102
Great northern diver	0	0.48	0	156	0	156
Guillemot	175,106	0.57	132,098	483,064	307204	658,170
Herring gull	8,989	0.48	9,738	86,165	18727	95,154
Kittiwake	67,692	0.53	60,029	315,815	127721	383,507
Lesser black-backed gull	34,945	0.60	23,297	52,596	58242	87,541
Manx shearwater	1,283,319	0.54	1,093,198	588,595	2376517	1,871,914
Puffin	54,238	0.55	44,377	31,984	98615	86,222
Razorbill	23,875	0.57	18,011	289,986	41886	313,861
Red-throated diver	0	0.60	0	2,445	0	2,445
Roseate tern	0	0.57	0	675	0	675
Sandwich tern	0	0.61	0	3,572	0	3,572
Shag	128	0.43	170	7,483	298	7,611

Table 12.12: BDMPS Non-breeding season populations (all age classes). The Irish component of Furness (2015) estimates for the western region were subtracted from the total and replaced with a revised Irish estimates derived from Cummins et al. (2019) and Burnell et al. (2023). The 'Revised BDMPS' (highlighted columns) are used in the assessment.

Species	Adult proportion (Furness 2015)	Irish colony counts with connectivity to western Irish Sea		Autumn			Winter / nonbreeding			Spring		
		Adults*	All age classes (adults / adult proportion)	Furness (2015) estimate	Irish component of Furness (2015) estimate	Revised BDMPS	Furness (2015) estimate	Irish component of Furness (2015) estimate	Revised BDMPS	Furness (2015) estimate	Irish component of Furness (2015) estimate	Revised BDMPS
Arctic tern	0.63	2,120	3,365	71,398	2,370	72,393	NA	NA	NA	71,398	2,370	72,393
Common tern	0.60	7,612	12,687	64,659	3,607	73,739	NA	NA	NA	64,659	3,607	73,739
Cormorant	0.46	3,672	7,983	NA	NA	NA	9,602	192	17,393	NA	NA	NA
Fulmar	0.62	7,484	12,071	828,194	0	840,265	556,367	0	568,438	828,194	0	840,265
Gannet	0.55	11,996	21,811	545,954	31,896	535,869	NA	NA	NA	661,888	39,096	644,603
Great black-backed gull	0.44	1,814	4,123	NA	NA	NA	52,122	1,912	54,333	NA	NA	NA
Great northern diver#	0.48	572	1,192	NA	NA	NA	300	0	751	NA	NA	NA
Guillemot	0.57	100,941	177,089	NA	NA	NA	1,139,220	0	1,316,309	NA	NA	NA
Herring gull	0.48	8,926	18,596	NA	NA	NA	173,299	7,360	165,939	NA	NA	NA
Kittiwake	0.53	21,418	40,411	911,586	19,040	932,957	NA	NA	NA	691,526	19,040	712,897
Lesser black-backed gull	0.60	6,540	10,900	163,304	4,074	170,130	41,159	1,778	50,281	163,304	4,074	170,130
Manx shearwater	0.54	2,170	4,019	1,580,895	8,737	1,576,177	NA	NA	NA	1,580,895	8,737	1,576,177
Puffin	0.55	2,188	3,978	NA	NA	NA	304,557	8,160	300,375	NA	NA	NA
Razorbill	0.57	16,785	29,447	606,914	5,950	630,411	341,422	5,950	364,919	606,914	5,950	630,411
Red-throated diver#	0.60	8,344	13,907	4,373	0	18,280	1,657	0	4,148	4,373	0	18,280
Roseate tern	0.57	3,748	6,575	2,100	2,100	6,575	NA	NA	NA	2,100	2,100	6,575
Sandwich tern	0.61	3,598	5,898	10,761	1,760	14,899	NA	NA	NA	10,761	1,760	14,899
Shag	0.43	2,340	5,442	NA	NA	NA	13,075	157	18,360	NA	NA	NA

* Summed counts for the following Irish counties: Dublin, Wicklow, Wexford, Waterford, Cork (south coast only) from Burnell et al. (2023)

Diver estimates derived from Jessopp et al. (2018)

12.5.2.18 The biogeographic populations with connectivity to UK waters (i.e. the total number of birds in the UK population plus each overseas population known to visit UK waters either to winter or during migration to winter quarters elsewhere) have also been considered in the assessment where appropriate, these are provided in Table 12.13.

Table 12.13: Biogeographic population sizes taken from definitions in Furness (2015) unless otherwise stated

Species	Biogeographic population with connectivity to UK Waters (adults and immatures)
Arctic skua	229,000
Arctic tern	628,000
Black-headed gull[a] (Not included in Furness, 2015)	4,250,000
Common gull[a] (Not included in Furness, 2015)	1,725,000
Common scoter[a] (Not included in Furness, 2015)	550,000
Common tern	480,000
Cormorant	324,000
Fulmar	8,055,000
Gannet	1,180,000
Great black-backed gull	235,000
Great northern diver	430,000
Guillemot	4,125,000
Herring gull	1,098,000
Kittiwake	5,100,000
Lesser black-backed gull	864,000
Little gull[b] (Not included in Furness, 2015)	75,000
Manx shearwater	2,000,000
Puffin	11,840,000
Razorbill	1,707,000
Red-throated diver	27,000
Sandwich tern	148,000
Shag	106,000

a Nonbreeding biogeographic population taken from Stroud et al., 2016 (http://data.jncc.gov.uk/data/d1b21876-d5a4-42b9-9505-4c399fe47d7e/ukspa3-status-uk-spas-2000s-web.pdf)

b Estimated passage population taken from Steinen et al., 2007.

Baseline mortality rates

12.5.2.19 The impact of additional mortality due to windfarm effects is assessed in terms of the change in the baseline mortality rate which could result. It has been assumed that all age classes are equally at risk of effects, with each age class affected in proportion to its presence in the population. Therefore, a weighted average baseline mortality rate has been calculated which is appropriate for all age classes for use in assessments, calculated for those species screened in for assessment. These were calculated using the different rates for each age class and their relative proportions in the population. Only those species for which impacts have been assessed (i.e. those scoped in for specific impacts in section 12.8 have been included.

12.5.2.20 Demographic rates for each species were taken from Horswill and Robinson (2015) and entered into a matrix population model. This was used to calculate the expected stable proportions in each age class (note, to obtain robust stable age class distributions for less well studied species such as divers it was necessary to adjust the rates in order to obtain a stable population size). Each age class survival rate was multiplied by its stable age proportion and the total for all ages summed to give the weighted average survival rate for all ages. Taking this value from 1 gives the average mortality rate. The demographic rates, and the age class proportions and average mortality rates calculated from them, are presented in Table 12.14.

Table 12.14: Average mortality across all age classes. Average mortality calculated using age specific demographic rates and age class proportions. Note that for some species (e.g. little gull) there are only estimates for adult survival

Species	Parameter	Survival (age class)							
		0-1	1-2	2-3	3-4	5-6	Adult	Productivity	Average mortality
Arctic tern	Demographic rate	-	-	-	-	-	0.837	0.38	0.163
	Population age ratio	-	-	-	-	-		-	
Black-headed gull	Demographic rate	-	-	-	-	-	0.825	0.625	0.175
	Population age ratio	-	-	-	-	-		-	
Common gull	Demographic rate	0.41	0.71	-	-	-	0.828	0.543	0.258
	Population age ratio	0.182	0.082	-	-	-	0.736	-	
Common tern[a]	Demographic rate	0.441	0.441	0.85	-	-	0.883	0.764	0.263
	Population age ratio	0.223	0.103	0.048	-	-	0.626	-	
Gannet	Demographic rate	0.424	0.829	0.891	0.895	-	0.912	0.7	0.191
	Population age ratio	0.191	0.081	0.067	0.06	-	0.6	-	
Great black-backed gull	Demographic rate	0.815	0.815	0.815	0.815		0.885	0.53	0.144
	Population age ratio	0.137	0.112	0.093	0.076		0.581	-	
Guillemot	Demographic rate	0.56	0.792	0.917	0.939	0.939	0.939	0.672	0.14
	Population age ratio	0.168	0.091	0.069	0.062	0.056	0.552	-	
Herring gull	Demographic rate	0.798	0.834	0.834	0.834		0.834	0.92	0.172
	Population age ratio	0.178	0.141	0.117	0.097		0.467		

Species	Parameter	Survival (age class)							
		0-1	1-2	2-3	3-4	5-6	Adult	Productivity	Average mortality
Kittiwake	Demographic rate	0.79	0.854	0.854	0.854		0.854	0.69	0.156
	Population age ratio	0.155	0.123	0.105	0.089		0.53	-	
Lesser black-backed gull	Demographic rate	0.82	0.885	0.885	0.885		0.885	0.53	0.124
	Population age ratio	0.134	0.109	0.095	0.083		0.579	-	
Little gull	Demographic rate	-	-	-	-	-	0.8	-	0.2
	Population age ratio	-	-	-	-	-		-	
Puffin[b]	Demographic rate	0.709	0.709	0.76	0.805	-	0.906	0.617	0.167
	Population age ratio	0.162	0.115	0.082	0.063	-	0.577	-	
Razorbill[c]	Demographic rate	0.63	0.63	0.895	0.895	-	0.895	0.57	0.174
	Population age ratio	0.159	0.102	0.065	0.059	-	0.613	-	
Red-throated diver	Demographic rate	0.6	0.62	-	-	-	0.84	0.571	0.228
	Population age ratio	0.179	0.145	-	-	-	0.676	-	

a Common tern have a combined survival rate from 0 to 2 of 0.441, giving an annual rate of 0.66.

b Puffin have a combined survival rate from 0 to 3 of 0.709, giving an annual rate of 0.89.

c Razorbill have a combined survival rate from 0 to 2 of 0.63, giving an annual rate of 0.79.

Intertidal ornithology

12.5.2.21 Bird species present within the intertidal zone during the nonbreeding season (November 2019 to March 2020) were recorded from the site-specific surveys carried out for the Proposed Development. A summary of the results is provided below, full details are presented in Volume III, Appendix 12.11: Arklow Bank Wind Park Phase 2 Onshore Cable Route and Landfall – Baseline Bird Survey and are not repeated here.

12.5.2.22 During winter surveys, a total of 11 bird species comprising divers, waders and gulls were recorded in low numbers from the two Vantage Point (VP) locations with a view of the landfall. Breeding season surveys confirmed the low value of the coastline for breeding seabirds, with no breeding activity recorded, with only a single cormorant and two herring gulls recorded.

12.5.2.23 Overall, the Intertidal Ornithology Study Area is not considered of high value for either seabirds or terrestrial species. The coastal habitat consists of low vegetated cliffs which are unsuitable for seabird nesting interspersed with small sand/gravel beaches which are unsuitable for wintering waders. Birds recorded were primarily gulls (the majority of which were black-headed gull and common gull). Small numbers of cormorant, shag, guillemot and red-throated diver were also recorded. Red-throated diver is listed on Annex 1 of the Birds Directive and two Red Listed gull species (black-headed gull and herring gull) were recorded during the site surveys (refer to Table 12.10 for conservation status). However, none of these species were seen in more than very small numbers and impacts at the landfall have been scoped out of further assessment (see section 12.6.2).

12.5.3 'Do nothing' scenario

12.5.3.1 Annex IV of the EIA Directive sets out the information required to be included in an EIAR. This includes "a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the Project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge". In the event that the Proposed Development does not proceed, an assessment of the future baseline conditions has been carried out and is described within this section.

12.5.3.2 Key drivers of seabird population size in western Europe are climate change (Sandvik *et al.*, 2012; Frederiksen *et al.*, 2004, 2013; Burthe *et al.*, 2014; Macdonald *et al.*, 2015; Furness, 2016; JNCC, 2016) and fisheries (Tasker *et al.*, 2000; Frederiksen *et al.*, 2004; Ratcliffe, 2004; Carroll *et al.*, 2017; Sydeman *et al.*, 2017). Pollutants (including oil, persistent organic pollutants, plastics), alien mammal predators at colonies, disease, and loss of nesting habitat also impact on seabird populations but are generally much less important and often more localised in their effect (Ratcliffe, 2004; Votier *et al.*, 2005, 2008; JNCC, 2016).

12.5.3.3 Trends in seabird numbers in breeding populations are better known, and better understood, than trends in numbers at sea within any particular area. Breeding numbers are regularly monitored at many colonies (JNCC, 2016), and in the British Isles (including Ireland) there have been four comprehensive censuses of breeding seabirds in 1969-70, 1985-88, 1998-2002 and 2015-2021 (Mitchell *et al.*, 2004, Burnell *et al.* 2023). Surveys in Ireland between 2015-21 have updated the breeding estimates for key colonies and species. The European Seabirds at Sea (ESAS) database is incomplete, and since 2000 relatively few data have been added, so that current trends in numbers at sea in areas of the Irish Sea are not so easy to assess. However, visual aerial surveys of the western Irish Sea in the 2015 and 2016 winters have provided a partial update on wintering distributions and abundance.

12.5.3.4 Breeding numbers of many seabird species in the British Isles are declining, although these are more pronounced in the North Sea than in western regions, including Ireland (Macdonald *et al.*, 2015). These trends seem likely to continue in the short to medium term future.

12.5.3.5 Climate change is likely to be the strongest influence on seabird populations in coming years, with anticipated deterioration in conditions for breeding and survival for most species of seabirds (Burthe *et al.*, 2014; Macdonald *et al.*, 2015; Capuzzo *et al.*, 2018) and therefore further declines in numbers of most of our seabird populations are anticipated. It is therefore highly likely that breeding numbers of most of our seabird species will continue to decline under a scenario with continuing climate change due to increasing levels of greenhouse gases (Prosser *et al.* 2023).

12.5.3.6 Fisheries management is also likely to influence future numbers in seabird populations. The Common Fisheries Policy (CFP) Landings Obligation ('discard ban') will likely reduce an unnaturally high level of available food as a result from discard from fishing practices that has been a food supply for scavenging seabirds such as great black-backed gulls, lesser black-backed gulls, herring gulls, fulmars, kittiwakes and gannets (Votier *et al.*, 2004; Bicknell *et al.*, 2013; Votier *et al.*, 2013; Foster *et al.*, 2017). Recent changes in fisheries management that aid recovery of predatory fish stock biomass are likely to further reduce food supply for seabirds that feed primarily on small fish such as sandeels, as those small fish are major prey of large predatory fish. Therefore, anticipated future increases in predatory fish abundance resulting from improved management to constrain fishing mortality on those commercially important species at more sustainable levels than in the past are likely to cause further declines in stocks of small pelagic seabird 'food-fish' such as sandeels (Frederiksen *et al.*, 2007; Macdonald *et al.*, 2015).

12.5.3.7 Future decreases in kittiwake breeding numbers are likely to be particularly pronounced, as kittiwakes are very sensitive to climate change (Frederiksen *et al.*, 2013; Carroll *et al.*, 2015) and to fishery impacts on sandeel stocks near breeding colonies (Frederiksen *et al.*, 2004; Carroll *et al.*, 2017), and additionally, the species may not be able to feed on a readily available food supply from fishery discards since the Landings Obligation came into effect (i.e. quota fish can no longer be discarded at sea but must now be landed in order to be counted against quotas). Gannet numbers may continue to increase for some years, but evidence suggests that this increase is already slowing, and numbers may peak not too far into the future. While the Landings Obligation will reduce discard availability to gannets in European waters, in recent years increasing proportions of adult gannets have wintered in west African waters rather than in UK waters (Kubetzki *et al.*, 2009), probably because there are large amounts of fish discarded by west African trawl fisheries and decreasing amounts available in the North Sea (Kubetzki *et al.*, 2009; Garthe *et al.*, 2012). It appears that the flexible behaviour and diet of gannets makes this species comparatively robust to changes in fishery practices or to climate change impacts on fish communities (Garthe *et al.*, 2012).

12.5.3.8 Fulmars, terns, common guillemot, razorbill and puffin appear to be highly vulnerable to climate change, so numbers may decline over the next few decades (Burthe *et al.*, 2014). Strong declines in shag numbers are likely to continue as they are adversely affected by climate change, by low abundance of sandeels and especially by stormy and wet weather conditions in winter (Burthe *et al.*, 2014; Frederiksen *et al.*, 2008). Most of the red-throated divers wintering in the Irish Sea are expected to originate from breeding areas at high latitudes in Greenland (Furness, 2015). Numbers of red-throated divers wintering in the Irish Sea may possibly decrease in future if warming conditions make the seas around Greenland more favourable as a wintering area so that they do not need to migrate as far as British and Irish waters. There has been a trend of increasing numbers of seaducks remaining in the Baltic Sea overwinter (Mendel *et al.*, 2008; Fox *et al.*, 2016; Ost *et al.*, 2016) and decreasing numbers coming to the British Isles (Austin and Rehfisch, 2005; Pearce-Higgins and Holt, 2013), and that trend is likely to continue, although to an uncertain extent.

12.5.3.9 Baseline surveys commenced prior to presence and widespread effects of highly pathogenic avian influenza virus (HPAIV) within seabird populations across the UK and western Europe, which have been particularly noteworthy since 2021. The current strain of HPAIV is more infectious than previous strains, and so infections have continued beyond the normal winter period and affected seabird breeding colonies in 2022 and 2023, including species which are not

normally affected such as gannets, great skuas, terns, guillemots and black-headed gulls. The scale of mortality has been unprecedented with significant losses of adult birds and even larger mortality of chicks reported. While the later surveys, from August 2023, may have been influenced by HPAIV, the estimated densities and abundances fall within the range of those recorded previously, so there is no indication that HPAIV has affected these survey data.

12.5.3.10 For the purposes of this assessment, all reference populations used have been estimated from data collected prior to the most widespread effects of HPAIV on seabirds in 2022-23, and therefore because the baseline aerial survey data were also collected prior to the outbreak, the predicted magnitudes of impacts on seabird populations should remain consistent with current populations (i.e. it is assumed that the proportion of the population affected by an impact will be similar before and after HPAIV impacts, with numbers of birds recorded within the study area declining proportionately with population sizes). Consequently, no adjustments to account for impacts of HPAIV on populations are considered necessary for the assessment.

12.5.4 Data limitations

12.5.4.1 The marine environment is highly variable, both spatially and temporally. The baseline site characterisation for the offshore ornithology impact assessment is based on two years of survey data collected within the Offshore Ornithology Study Area which are considered to provide representative seabird usage for the purposes of impact assessment.

12.5.4.2 During the baseline surveys for the Proposed Development, it was not possible to undertake a digital aerial survey in April 2019 due to adverse weather conditions. However, an extra survey was carried out in July 2019 and the second April survey was carried out in 2020 to address the data gap for this month (refer to Volume III, Appendix 12.1: Offshore Ornithology Technical Report). It is not unusual for at least one survey to be affected by unsuitable or unsafe weather conditions for surveying in this manner over the course of the two years of data collection, and the approach for addressing this is similarly appropriate.

12.6 Impact assessment methodology

12.6.1 Key parameters for assessment

12.6.1.1 The assessment of significance of effects has been carried out on both of the two discrete Project Design Options detailed in Volume II, Chapter 4: Description of Development (Revised March 2026). This approach has allowed for a robust and full assessment of the Proposed Development.

12.6.1.2 The two Project Design Options and parameters relevant to each potential impact are detailed in Table 12.15 and Table 12.16. Note that Project Design Option 1 (Table 12.15) has two variants (identified as 1a and 1b) which differ only in the blade chord width and the average rotation speed. As these parameters can result in different predicted collision risks both 1a and 1b have been assessed.

12.6.1.3 The Project Design Options identified in Table 12.15 and Table 12.16 have been assessed for their potential effects on identified receptors or receptor groups (a receptor group is defined as multiple species which share ecological features that put them at similar risk of impacts). These scenarios are a summary of the full project parameters provided in Volume II, Chapter 4: Description of Development (Revised March 2026).

Table 12.15: Project design parameters and impacts assessed – Project Design Option 1 (WTG model 1a and 1b).

Potential impact	Phase			Project Design Options 1 (WTG model 1a and 1b)
	C	O	D	
Disturbance and displacement	✓	✓	✓	**Construction phase** Disturbance and displacement from construction activity, including increased vessel and helicopter activity: • Installation of 53 Wind Turbine Generators (WTGs) and 2 OSPs within the Array Area; • Maximum of 1 foundation installed at any one time (within any 24 hour period); • Maximum of 69 installation vessels in the Array Area at any one time (including 12 installation vessels along the Cable Corridor and Working Area at any one time, and maximum of 7 installation vessels in the vicinity of the landfall at any one time); • Maximum of 3 helicopters in the Array Area at any one time; and • Maximum construction schedule of 24 hours a day, 7 days a week for a maximum construction period of 5 years. Within this period, offshore export cable installation may take place over a period of 12 months. **Operational and maintenance phase** Disturbance and displacement from operational and maintenance activity, including increased vessel and helicopter activity: • Presence of 55 (i.e. 53 x WTG + 2 x OSP) monopile foundations with base diameter between 7 – 11 m for WTGs and 7-14 m for OSPs and associated scour protection; • Presence of associated cable protection for between 110 – 122 km inter-array cables, 25-28 km interconnector and between 35 – 40 km offshore export cables. Assumes a maximum of 15% of inter-array cable route, 50% of interconnector and 20% of offshore export cable route may require cable protection; • Minimum spacing of 500 m between turbine blade tips; • A maximum of 1,359 vessel return trips per annum for supporting windfarm operations comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels; • A maximum of 485 helicopter movements making return trips per annum for supporting windfarm operations; and • Operational phase of up to 36.5 years. **Decommissioning phase** Disturbance is anticipated to be similar in nature but of lower magnitude than during construction.
Indirect disturbance and displacement	✓	✓	✓	**Construction phase** Parameters as described in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) for the following impacts:

Potential impact	Phase			Project Design Options 1 (WTG model 1a and 1b)
	C	O	D	
resulting from changes to prey and habitats				• Temporary subtidal habitat loss/disturbance; • Increased suspended sediment concentrations and associated sediment deposition; and • Accidental pollution. Parameters as described in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) for the following impacts: • Injury and/or disturbance to fish and shellfish from underwater noise and vibration. **Operational and maintenance phase** Parameters as described in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) for the following impacts: • Temporary subtidal habitat loss/disturbance; • Increased suspended sediment concentrations and associated sediment deposition; • Accidental pollution; • Long-term subtidal habitat loss; and • Alteration of seabed habitats arising from effects on physical processes. **Decommissioning phase** As above for construction phase. There would be limited noise disturbance to prey (as no piling).
Collision risk	×	✓	×	**Operational and maintenance phase** • Presence of 53 wind turbines within the Array Area: • Hub height of 155 m above Lowest Astronomical Tide (LAT); • Lower blade tip height of 37 m above LAT; • Upper blade tip height of 273 m above LAT; and • Rotor diameter of 236 m. • Average rotation speed (RPM) 6.34 (1a) and 5.73 (1b) Further details are provided in Volume III, Appendix 12.4: Offshore Ornithology: Collision Risk Input Parameters
Barrier effect	×	✓	×	**Operational and maintenance phase** • Presence of 53 wind turbines within an Array Area of 63.4 km^2 with a minimum spacing of 500 m between turbine blade tips; and • Presence of two OSPs.

Table 12.16: Project design parameters and impacts assessed - Project Design Option 2

Potential impact	Phase			Project Design Option 2
	C	O	D	
Disturbance and displacement	✓	✓	✓	**Construction phase** Disturbance and displacement from construction activity, including increased vessel and helicopter activity and confirmatory surveys (see Volume II, Chapter 4: Description of Development (Revised March 2026) Table 4.10): • Installation of 47 WTGs and 2 x OSPs within the Array Area; A maximum of 1 foundation installed at any one time (within any 24 hour period); • A maximum of 69 installation vessels in the Array Area at any one time (including 12 installation vessels along the Cable Corridor and Working Area at any one time, and 7 installation vessels in the vicinity of the landfall at any one time); • A maximum of 3 helicopters in the Array Area at any one time; and • Maximum construction schedule of 24 hours a day, 7 days a week for a maximum construction period of 5 years. Within this period, offshore export cable installation may take place over a period of 12 months. **Operational and maintenance phase** Disturbance and displacement from operational and maintenance activity, including increased vessel and helicopter activity: • Presence of 49 (i.e. 47 x WTG + 2 x OSP) monopile foundations with base diameter between 7 – 11 m for WTGs and 7 - 14 m for OSPs and associated scour protection; • Presence of associated cable protection for between 110 – 122 km inter-array cables, 25-28 km interconnector and between 35 – 40 km offshore export cables. Assumes a maximum of 15% of inter-array cable route, 50% of interconnector and 20% of offshore export cable route may require cable protection; • Minimum spacing of 500 m between turbine blade tips; • A maximum of 1,359 vessel return trips per annum for supporting windfarm operations comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels; • A maximum of 485 helicopter movements making return trips per annum for supporting windfarm operations; and • Operational phase of up to 36.5 years. **Decommissioning phase** Disturbance is anticipated to be similar in nature but of lower magnitude than during construction.
Indirect disturbance and displacement resulting from	✓	✓	✓	**Construction phase** Parameters as described in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) for the following impacts:

Potential impact	Phase C	Phase O	Phase D	Project Design Option 2
changes to prey and habitats				• Temporary subtidal habitat loss/disturbance; • Increased suspended sediment concentrations and associated sediment deposition; and • Accidental pollution. Parameters as described in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) for the following impacts: • Injury and/or disturbance to fish and shellfish from underwater noise and vibration. **Operational and maintenance phase** Parameters as described in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) for the following impacts: • Temporary subtidal habitat loss/disturbance; • Increased suspended sediment concentrations and associated sediment deposition; • Accidental pollution; • Long-term subtidal habitat loss; and • Alteration of seabed habitats arising from effects on physical processes. **Decommissioning phase** As above for construction phase. There would be limited noise disturbance to prey (as no piling).
Collision risk	×	✓	×	**Operational and maintenance phase** • Presence of 47 wind turbines within the Array Area: • Hub height of 162 m above Lowest Astronomical Tide (LAT); • Lower blade tip height of 37 m above LAT; • Upper blade tip height of 287 m above LAT; and • Rotor diameter of 250 m.
Barrier effect	×	✓	×	**Operational and maintenance phase** • Presence of 47 wind turbines within an Array Area of 63.4 km2 with a minimum spacing of 500 m between turbine blade tips; and • Presence of two OSPs.

12.6.2 Impacts scoped out of the assessment

12.6.2.1 On the basis of the baseline environment and the description of development outlined in Volume II, Chapter 4: Description of Development (Revised March 2026), a number of impacts are proposed to be scoped out of the assessment for offshore ornithology. These impacts are outlined, together with a justification for scoping them out, in Table 12.17.

Table 12.17: Impacts scoped out of the assessment for offshore ornithology

Potential impact	Justification
Indirect impacts on prey species and habitat along the Cable Corridor and Working Area during the operational and maintenance phase	Maintenance or repair operations will be localised and infrequent.
Accidental pollution during construction, operation and decommissioning phases	The Marine Pollution Contingency Plan (MPCP) provides the pollution response arrangements for the Proposed Development, and therefore this impact can be scoped out for all phases (see Volume III, Appendix 25.1: Environmental Management Plan, Annex 2 Marine Pollution Contingency Plan).
Disturbance and displacement (maintenance vessels)	During the operational and maintenance phase, the presence of vessels and personnel undertaking routine operations and maintenance activity at the windfarm and along the offshore export cable route may cause localised, temporary disturbance and displacement. However, due to the nature of this impact (temporary/localised), any displaced birds may readily redistribute to areas of lower or no activity on site without impacting on fitness. It is therefore proposed that this impact is scoped out of the EIAR.
Collision risk to migrating passerines	Studies at onshore sites have reported migrant passerine collision rates of 0.01-0.02% (Winkleman 1992), 0.01% (Krjgsveld *et al.* 2009) and 0.077% (Krjgsveld *et al*. 2011). These represent collision rates of between 1 in 1,300 to 10,000 individuals passing through a wind farm (estimates reflected whole wind farms in these studies). At these very low collision rates (which the authors describe as precautionary) it is clear that population level effects will be undetectable. A recent study conducted at a coastal wind farm in Denmark using a combination of techniques including cameras, radar and carcass searches (Liedtke *et al.* 2025) has also found reported very low rates of passerine collision, with an estimated 99.9% avoidance rate. Preliminary results from vantage point (VP) surveys conducted during autumn 2025 at two coastal locations (Wicklow Head and Kilmichael Point) and Passive Acoustic Monitoring (PAM) surveys (conducted at Wicklow Head; Volume III, Appendix 12.19: Offshore Ornithology Technical Report - Migratory Bird Survey Methods (RFI March 2026)) have confirmed that passerine movements are generally low in number, confined to nearshore waters (less than 2km), conducted

Potential impact	Justification
	below rotor height (less than 20m) and follow coastal routes (i.e. will not encounter ABWP2). Therefore, consideration of all these aspects (passage movements, population sizes, flight directions and flight heights) and the relative size of the Proposed Development mean that the risks to migrating passerine species are considered negligible and have been scoped out. This is consistent with the standard approach to assessment of ornithological impacts applied to UK offshore windfarms.
Impacts on seabirds and terrestrial bird species at the offshore export cable landfall.	The Intertidal Ornithology Study Area is not considered of high value for either seabirds or terrestrial species. The coastal habitat consists of low vegetated cliffs which are unsuitable for seabird nesting interspersed with small sand/gravel beaches which are unsuitable for wintering waders. Birds recorded were primarily gulls (the majority of which were black-headed gull and common gull). Small numbers of cormorant, shag, guillemot and red-throated diver were also recorded. Red-throated diver is listed on Annex 1 of the Birds Directive and two Red Listed gull species (black-headed gull and herring gull) were recorded during the site surveys (refer to Table 12.10 for conservation status). However, none of these species were seen in more than very small numbers and impacts at the landfall have been scoped out of further assessment.
Lighting during construction and operation	Lighting of construction sites, vessels and other structures at night may potentially attract birds (phototaxis). Phototaxis can be a serious hazard for fledglings of some seabird species, particularly those that nest in burrows such as petrels and shearwaters (Deppe *et al.*, 2017; Raine *et al.*, 2007; Rodríguez *et al.*, 2015 and Deakin *et al*. 2022). Research indicates that this impact occurs over short distances in response to bright light close to breeding colonies. It is not seen over large distances or in older (adult and immature) seabirds. A review of the potential effects of operational lighting on turbines on birds considered available evidence to investigate potential impacts across eight categories (MacArthur Green, 2018). This suggested that lights on offshore wind turbines in European shelf seas are extremely unlikely to have any detectable effect on birds. The key features of the Proposed Development which strongly indicate lighting will not give rise to impacts include: • The site is not close to any breeding colonies for burrow nesting species; • The turbines will utilise much lower power lights than those associated with observations of attraction (e.g. lighthouses); • There will not routinely be vessels present during hours of darkness; and, • The site is not heavily used by the species identified as at risk (petrels and shearwaters) and does not appear to offer foraging opportunities for these species.

Potential impact	Justification
	Consequently the risk of adverse lighting effects has been scoped out. Phototaxis of nocturnal migrating birds has been recorded, especially in autumn during conditions of poor visibility, but is generally seen where birds are exposed to intense white lighting such as from lighthouses; light from construction sites will be much less powerful than that from lighthouses, and therefore this can be scoped out.

12.7 Methodology for assessing the significance of effects

12.7.1 Overview

12.7.1.1 The offshore ornithology impact assessment has followed the methodology set out in Volume II, Chapter 5: EIA Methodology (Revised March 2026). Specific to the offshore ornithology impact assessment, the following guidance documents have also been considered:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Marine and Coastal published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018);
- Assessment methodologies for offshore windfarms (Maclean *et al.*, 2009);
- Guidance on ornithological cumulative impact assessment for offshore wind developers (King *et al.*, 2009);
- Advice on assessing displacement of birds from offshore windfarms (JNCC *et al.*, 2017);
- Collision Risk Modelling (CRM) to assess bird collision risks for offshore windfarms (Band, 2012);
- Assessing the risk of offshore windfarm development to migratory birds (Wright *et al.*, 2012);
- Vulnerability of seabirds to offshore windfarms (Furness and Wade, 2012; Furness *et al.*, 2013; Wade *et al.*, 2016);
- Mapping seabird sensitivity to Offshore Windfarms (Bradbury *et al.*, 2014);
- The avoidance rates of collision between birds and offshore turbines (Cook *et al.*, 2014);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards (Parker *et al.* 2022a,b,c); and
- Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review (JNCC *et al.*, 2014).

12.7.1.2 The impact assessment methodology applied in this Chapter has also been consulted on with NPWS and Birdwatch Ireland through the Scoping Report and previous consultation (see Volume III Appendix 3.1 Consultation Report) and, due to the more developed nature of statutory guidance in the UK than Ireland, follows the industry standard approaches used for UK offshore windfarm assessment.

12.7.1.3 In addition, the offshore ornithology impact assessment has considered the legislative framework as defined by:

- Birds Directive – Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Codified version);
- The European Communities (Birds and Natural Habitats Regulations 2011 (S. I. No. 477 of 2011); and
- Wildlife Acts 1976 to 2012 (as amended).

12.7.2 Impact assessment criteria

12.7.2.1 This section describes the criteria applied in this Chapter to assign values to the sensitivity of the receptors and the magnitude of potential impacts. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume II, Chapter 5: EIA Methodology (Revised March 2026) of the EIAR.

Sensitivity

Table 12.18: Definitions of sensitivity of the receptor

Receptor sensitivity	Definition
High	Adaptability: The bird species has no capacity to adapt to an impact. Tolerance: Bird species has very limited tolerance to source of impact. Recoverability: The effect on the bird species is anticipated to be of permanent (>50 years) or long-lasting duration (15-50 years). Value: A species for which individuals at risk can be clearly connected to a particular SPA
Medium	Adaptability: The bird species has limited capacity to adapt to an impact. Tolerance: Bird species has limited tolerance to source of impact Recoverability: The effect on the bird species is anticipated to be long-lasting (15-50 years). Value: A species for which individuals at risk are probably drawn from particular SPA populations, although other colonies (both SPA and non-SPA) may also contribute to individuals observed on the windfarm
Low	Adaptability: The bird species has some capacity to adapt to an impact. Tolerance: Bird species has some tolerance to source of impact Recoverability: The effect on the bird species is anticipated to be of medium-term duration (up to 15 years) Value: A species for which it is not possible to identify the SPAs from which individuals on the windfarm have been drawn, or for which no SPAs are designated
Negligible	Adaptability: The bird species has high levels of adaptability to an impact. Tolerance: Bird species is generally tolerant to source of impact Recoverability: The effect on the bird species is anticipated to be of no more than short term duration (up to 5 years) Value: A species which is not a designated feature of any SPAs

Magnitude

Table 12.19: Example definition of terms relating to the magnitude of an impact. Note that for any given level of magnitude not all the definitions are necessarily expected to be met for any given

impact (e.g. frequency may be high, while consequence is low) and expert judgement has been used in their application to impacts

Magnitude	Definition
High	Extent: A large change in the size or distribution of the relevant biogeographic population or interest feature of a designated site. Duration: Short to long term, recovery from the change predicted in the long-term (>5 years) following cessation of activity. Frequency: Impact is ongoing throughout lifetime of the Proposed Development. Probability: Highly likely to occur. Consequences: Irreversibly alter the population in the short to long term and alter the long-term viability of a population or the integrity of a designated site (guide >5% increase in background mortality).
Medium	Extent: A medium change in the size or distribution of the relevant biogeographic population or interest feature of a designated site. Duration: Short to long term, recovery from the change predicted in the medium-term (<5 years) following cessation of activity. Frequency: Impact is ongoing throughout lifetime of the Proposed Development. Probability: Likely to occur. Consequences: Affects the population in the short to long term but reversible on cessation of the impact and not predicted to affect the long-term viability of the population or the integrity of a designated site (guide between 1-5% increase in background mortality).
Low	Extent: A small change in the size or distribution of the relevant biogeographic population or interest feature of a designated site. Duration: Short to long term, recovery from the change predicted in the short-term (<1 years) following cessation of activity. Frequency: Impact is ongoing throughout lifetime of the Proposed Development. Probability: Low likelihood of occurrence. Consequences: Affects the population in the short to long term but reversible on cessation of the impact and not predicted to affect the medium or long-term viability of the population or the integrity of a designated site (guide between 0.1-1% increase in background mortality).
Negligible	Extent: Very small change in the size or distribution of the relevant biogeographic population or interest feature of a designated site. Duration: Short to long term, recovery from the change predicted to be rapid (<0.5 years) following cessation of activity. Frequency: Impact may be ongoing throughout lifetime of the Proposed Development, or a one-off short-term effect.

Magnitude	Definition
	Probability: Very low likelihood of occurrence. Consequences: Unlikely to affect the population in the short to long term, fully reversible with a short period on cessation of the impact and not predicted to affect the medium or long-term viability of the population or the integrity of a designated site (guide <0.1% increase in background mortality).

Significance of effect

12.7.2.2 The significance of the effect upon ornithology receptors is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 12.20. Where a range of significance of effect is presented in Table 12.20, the final assessment for each effect is based upon expert judgement.

Table 12.20: Significance of effect matrix

			Baseline Environment - Sensitivity			
			High	Medium	Low	Negligible
Description of Impact - Magnitude	Adverse Impact	High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible
		Medium	Significant	Moderate*	Slight	Imperceptible
		Low	Moderate*	Slight	Slight	Imperceptible
	Neutral Impact	Negligible	Not Significant	Not Significant	Not Significant	Imperceptible
	Positive Impact	Low	Moderate*	Slight	Slight	Imperceptible
		Medium	Significant	Moderate*	Slight	Imperceptible
		High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible

**Moderate levels of effect have the potential, subject to the assessor's professional judgement to be significant or not significant. Moderate will be considered as significant or not significant in EIA terms, depending on the sensitivity and magnitude of change factors evaluated. These evaluations are explained as part of the assessment, where they occur.*

12.7.3 Factored in measures

12.7.3.1 The Project Design Options set out in Volume II, Chapter 4: Description of Development (Revised March 2026) include a number of designed-in measures and management measures (or controls) which have been factored into the Proposed Development and are committed to be delivered by the Developer as part of the Proposed Development.

12.7.3.2 These factored-in measures are standard measures applied to offshore wind development, including lighting and marking of the Proposed Development, use of 'soft-starts' for piling operations etc, to reduce the potential for impacts across receptor groups and also standard best practice for vessel management, in particular with reference to preventing fuel and oil spillage. Factored-in measures relevant to the assessment on offshore ornithology are presented in Table 12.21. These measures are integrated into the description of development and have therefore been considered in the impact assessment (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development. This approach is in line with EPA guidance which states that 'in an EIAR it may be useful to describe avoidance measures that have been integrated into the proposed proposal' (EPA, 2022).

Table 12.21: Factored in measures

Factored in measures	Justification
An Environmental Management Plan (EMP) has been prepared and will be implemented during the construction, operational and maintenance and decommissioning phases of the Proposed Development. The EMP includes mitigation/monitoring measures and commitments made within the EIAR and a Marine Pollution Contingency Plan (MPCP) which will include key emergency contact details (e.g. EPA). An EMP is included in Volume III, Appendix 25.1: Environmental Management Plan.	Measures will be implemented to ensure that the potential for release of pollutants from construction, operational and maintenance, and decommissioning plant is minimised.
An Environmental Vessel Management Plan (EVMP) has been submitted as part of the application (Volume III, Appendix 25.10: Environmental Vessel Management Plan)	The EVMP: • Minimises the risk of collision and injury to marine wildlife; • Minimises the risk of disturbance to marine wildlife; • Offers guidance to contractors conducting activities on behalf of the Proposed Development in proximity to wildlife; and • Provides contractors with the procedures for reporting vessel collisions with marine mammals.
Maximum number of wind turbines of 53.	The number of wind turbines has been refined to minimise the potential collision risk impacts (see Volume II, Chapter 3: Consideration of Alternatives) (Revised March 2026).
Minimum lower blade tip height of 37 m above LAT	Minimises potential seabird collision risks since the abundance of birds decreases with increasing height above the sea surface.
Best practice vessel and marine machinery operation, including but not limited to: • All hazardous substances stored in a dedicated storage room; • Substances categorized as “Danger” will be stored in a locker and may only be used with a Permit To Work; • Updated Material Data Safety Sheet (MDSS) will be readily accessible in storage rooms; • The amount of hazardous material is kept to a minimum; • Hazardous substances stored, handled and disposed of in accordance with the regulations in force; • All storage facilities and handling equipment will be in good working order and designed in such a way as to prevent and contain any spillage as far as practicable; • Use appropriate and certified hoses only;	The identified measures have been proposed specifically to prevent diminution of water quality and associated deterioration of Annex I habitat types or accidental spillages of oil products from causing a reduction in prey biomass of qualifying species or oiling of seabirds.

Factored in measures	Justification
• Procedures in case of bunkering, spillage, SOPEP, discussed in a toolbox before each bunker operation; • Identified personnel trained in the use of equipment; • Regular drills; • Spill kits located near hydrocarbon storage areas and replenished if required; and, • Retention around the work area	
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339).	The Developer was granted a Foreshore Licence (FS007339) for Site Investigations (associated with the Proposed Development) from the Minister for Housing, Local Government and Heritage in May 2022. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339) being carried out. As such there is no temporal overlap between the activities consented in this Foreshore Licence and the Proposed Development and there will be no potential for cumulative effects.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out.	The Developer submitted a Foreshore Licence Application for Site Surveys to the Minister for Housing, Local Government and Heritage in April 2023 (FS007555) and this application is pending determination. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out. As such there is no temporal overlap between the activities proposed in the Foreshore Licence Application and the Proposed Development.

12.8 Assessment of the significance of effects

12.8.1.1 The impacts of the construction, operational and maintenance and decommissioning phases of both Project Design Options forming the Proposed Development on offshore ornithological features have been assessed. The potential impacts arising from the construction, operational and maintenance and decommissioning phases of the Proposed Development are listed in Table

12.15 and Table 12.16, along with the project parameters against which each impact has been assessed.

12.8.1.2 A description of the potential effect on offshore ornithology receptors caused by each identified impact is provided in Section 12.9 and Section 12.11.

12.9 Assessment of Project Design Option 1 (WTG models 1a and 1b) and Project Design Option 2

12.9.1.1 A description of the potential effect on offshore ornithology receptors caused by each identified impact due to construction traffic and operational WTGs, as well as barriers is given below.

12.9.2 Impact 1 – Project Design Option 1a Direct disturbance and displacement

Construction phase

12.9.2.1 Construction activities within the Array Area and along the Cable Corridor and Working Area, including the installation of foundations, WTGs, OSPs, offshore export cables, interconnector cables, inter-array cables and associated vessel and helicopter traffic, have the potential to directly affect bird populations through disturbance, leading to displacement of birds. This would effectively result in temporary habitat loss through a reduction in the area available for bird activities (e.g. feeding, loafing and moulting). The project design (Table 12.15) describes the elements of the Proposed Development considered within this assessment.

12.9.2.2 The maximum duration of offshore construction for the Proposed Development is four years, which would overlap with a maximum of five breeding seasons, five winter periods and up to ten migration periods, although it is important to note that construction activity would not be continuous nor widespread throughout this period but instead would occur in discrete phases and localised areas. For example, no more than one foundation is expected to be installed at any one time. Consequently, the effects will occur only in the vicinity of vessels which are operating at any given point and not across the entire Array Area.

12.9.2.3 Any impacts resulting from disturbance and displacement from construction activities are considered likely to be short term, temporary and reversible in nature, lasting only for the duration of construction activity, with birds expected to return to the area once construction activities have ceased.

12.9.2.4 Construction related disturbance and displacement is most likely to be of concern for breeding birds whilst foraging, since at other times of year birds are expected to be less constrained and will be more able to exploit alternative locations.

12.9.2.5 Some species are more susceptible to disturbance than others. Gulls are not considered susceptible to disturbance, as they are often associated with fishing boats (e.g. Camphuysen, 1995; Hüppop and Wurm, 2000) and have been noted in association with construction vessels at the Greater Gabbard offshore windfarm (GGOWL, 2011) and close to active foundation piling activity at the Offshore Windfarm Egmond aan Zee (OWEZ), where they showed no noticeable reactions to the works (Leopold and Camphuysen, 2007). However, species such as divers and scoters have been noted to avoid shipping by several kilometres (Mitschke *et al.*, 2001 from Exo *et al.*, 2003; Garthe and Hüppop, 2004; Schwemmer *et al.*, 2011) and recent work in relation to German offshore windfarms has reported displacement extending up to 10 km in late winter (Vilela *et al.*, 2020).

12.9.2.6 There are a number of different measures used to assess bird disturbance and displacement from areas of sea in response to activities associated with an offshore windfarm. Garthe and Hüppop (2004) developed a scoring system for such disturbance factors, which is used widely in offshore

windfarm EIAs. Furness and Wade (2012) developed disturbance ratings for particular species, alongside scores for habitat flexibility and conservation importance. These factors were used to define an index value that highlights the sensitivity of a species to disturbance and displacement. As many of these references relate to disturbance from helicopter and vessel activities, these are considered relevant to this assessment. Although, all else being equal, a helicopter may constitute a more pronounced source of disturbance than a vessel, the combination of higher speed (and hence briefer presence) and greater distance to the sea surface means that helicopter disturbance is considered to be the same or lower than that resulting from vessel movements. Thus, the following assessment is based on disturbance due to vessels and it has been assumed that this also encompasses disturbance due to helicopters.

12.9.2.7 Birds recorded during the species-specific spring and autumn migration periods are assumed to be moving through the area between breeding and wintering areas. As these individuals will be present in the site for a short time only and the potential zone of construction displacement will be small (i.e. that located around up to two foundations and around individual installation vessels), it is likely that the assessment presented below for the migration periods will over-estimate population impacts and in that regard presents a conservative assessment.

12.9.2.8 In order to focus the assessment of disturbance and displacement, a screening exercise was undertaken to identify those species most likely to be at risk (Table 12.22), presented in order of sensitivity to disturbance and displacement). Any species with a low sensitivity to displacement or recorded only in very small numbers within the Array Area and along the Cable Corridor and Working Area was screened out of further assessment.

Table 12.22: Construction disturbance and displacement screening

Receptor	General sensitivity to disturbance and displacement (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.*, 2016, Dierschke *et al.*, 2016)	Screening Result (IN or OUT)
Red-throated diver	Very High	**Screened IN** as has potentially very high sensitivity to disturbance and displacement within the Array Area and the Cable Corridor and Working Area. Peak population is moderate within the Array Area and low along the Cable Corridor and Working Area.
Common scoter	Very High	**Screened OUT** due to very low peak population recorded in Array Area and absence from Cable Corridor and Working Area, although has a very high sensitivity to disturbance and displacement.
Great northern diver	Very High	**Screened OUT** due to very low peak population recorded in Array Area and Cable Corridor and Working Area, although has a very high sensitivity to disturbance and displacement.
Cormorant	High	**Screened OUT** due to very low peak population recorded in Array Area and absence from Cable Corridor and Working Area, although has high sensitivity to disturbance and displacement.
Guillemot	Medium	**Screened IN** due to high peak population in Array Area and moderate peak in Cable Corridor and

Receptor	General sensitivity to disturbance and displacement (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.*, 2016, Dierschke *et al.*, 2016)	Screening Result (IN or OUT)
		Working Area, and has medium sensitivity to disturbance and displacement.
Razorbill	Medium	**Screened IN** due to moderately high peak population in Array Area and Cable Corridor and Working Area, and has medium sensitivity to disturbance and displacement.
Shag	Medium	**Screened OUT** due to moderately low peak population recorded in Array Area and absence from Cable Corridor and Working Area, and has medium sensitivity to disturbance and displacement.
Puffin	Low to Medium	**Screened OUT** due to low peak population recorded in Array Area and Cable Corridor and Working Area; also has low to medium sensitivity to disturbance and displacement.
Fulmar	Considered Low in some studies, but possibly high according to Dierschke *et al.,* (2016)	**Screened OUT** due to very low peak population recorded in Array Area and absence from Cable Corridor and Working Area, is generally considered to have a low sensitivity to disturbance and displacement and is not known to avoid vessels.
Gannet	Considered Low in some studies, but possibly high according to Dierschke *et al.,* (2016)	**Screened OUT** due to low peak population recorded in Array Area and absence from Cable Corridor and Working Area, is generally considered to have a low sensitivity to disturbance and displacement and is not known to avoid vessels.
Arctic tern	Low	**Screened OUT** due to low sensitivity to disturbance and displacement, although has low to moderate peak population in Array Area and Cable Corridor and Working Area.
Common tern	Low	**Screened OUT** due to low peak population recorded in Array Area and Cable Corridor and Working Area; has low to medium sensitivity to disturbance and displacement.
Sandwich tern	Low	**Screened OUT** due to low peak population recorded in Array Area and Cable Corridor and Working Area; has low to medium sensitivity to disturbance and displacement.
Arctic skua	Low	**Screened OUT** as has low sensitivity to disturbance and displacement and no birds recorded within Array Area or Cable Corridor and Working Area.

Receptor	General sensitivity to disturbance and displacement (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.*, 2016, Dierschke *et al.*, 2016)	Screening Result (IN or OUT)
Black-headed gull	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.
Common gull	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.
Great black-backed gull	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.
Herring gull	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.
Kittiwake	Low	**Screened OUT** as is generally considered to have a low sensitivity to disturbance and displacement and is not known to avoid vessels although this species does have a high peak population in the Array Area. See Volume III, Appendix 12.13: Offshore Ornithology Technical Report - Kittiwake Displacement Evidence Review (RFI March 2026) for details.
Lesser Black-backed gull	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.
Little gull	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.
Manx shearwater	Low	**Screened OUT** as has low sensitivity to disturbance and displacement.

RED-THROATED DIVER

CABLE CORRIDOR AND WORKING AREA

12.9.2.9 There is potential for disturbance and displacement of red-throated diver during autumn migration, winter, and spring migration red-throated divers resulting from the presence of vessels installing the offshore cables along the Cable Corridor and Working Area.

12.9.2.10 In order to calculate the number of red-throated divers that would potentially be at risk of displacement from the Cable Corridor and Working Area during the cable laying process, the density of red-throated divers present in the Cable Corridor and Working Area was estimated from the site-specific surveys carried out for the Proposed Development (refer to section 12.5.2.7 and Volume III, Appendix 12.1: Offshore Ornithology Technical Report Overview (Revised March 2026)). The method used to estimate the density within the Cable Corridor and Working Area was the same as that for the Array Area itself; the number recorded in the sections of the digital aerial survey transects which crossed the Cable Corridor and Working Area was divided by the area of these overlapping sections.

12.9.2.11 Red-throated divers were recorded within the Cable Corridor and Working Area generally in low numbers during the nonbreeding season in October, January, February, March, April and May,

although moderately high numbers were recorded in November and December, with a peak in December (3.8 birds/km^2).

12.9.2.12 Red-throated divers were not recorded in the Cable Corridor and Working Area in June to September. Although March, April and May were identified as breeding months in Furness (2015), this species does not breed in the Irish Sea, nor onshore in proximity to the Array Area and individuals recorded at this time are considered to be part of the spring migration population (February to April; Furness, 2015).

12.9.2.13 The area from which birds could be displaced has been defined for the purposes of this assessment as a circle with a 2 km radius around each cable laying vessel as a precautionary assumption, which is an area of 12.56 km^2. This assessment also assumes that there would be 100% displacement of red-throated divers within the 2 km buffer surrounding one cable laying vessel. This 100% displacement from vessels is consistent with Garthe and Hüppop (2004) and Schwemmer *et al.* (2011) since they suggested that all red-throated divers present fly away from approaching vessels at a distance of often more than 1 km.

12.9.2.14 It is assumed that the mortality of displaced red-throated divers will be between 1% and 10%, following the approach recommended by Natural England (Parker *et al.* 2022) for offshore windfarm assessment.

12.9.2.15 However, previous studies have shown that mortality rate of displaced red-throated divers is likely to be less than 10% (Dierschke *et al.*, 2017, MacArthur Green, 2019a; see section 12.9.2.140 for further details). Definitive mortality rates associated with displacement for red-throated divers, or for any other seabird species, are not currently known and a degree of precaution is therefore appropriate. The mechanism by which mortality due to displacement could occur would be most likely due to increased density in unaffected areas, resulting in increased competition for food (Dierschke *et al.*, 2017). However, there is no evidence that birds displaced from windfarms are at risk of mortality as a consequence of displacement and the available evidence suggests that red-throated divers are unlikely to be affected by density-dependent competition for resources during the non-breeding period (Dierschke *et al.*, 2017).

12.9.2.16 On this basis, impacts are considered likely to be small or negligible (i.e. below the 10% mortality rate assumed by Natural England), and below levels that could be quantified. Impacts of displacement are also likely to be context dependent. In years when food supply has been severely depleted, as for example by unsustainably high fishing mortality of sandeel stocks as has occurred several times in recent decades (ICES, 2013), displacement of sandeel-dependent seabirds from optimal habitat may increase mortality. In contrast, in years when food supply is good, displacement is unlikely to have any negative effect on seabird populations. Red-throated divers may feed on sandeels, but take a wide diversity of small fish prey, so would be buffered to an extent from fluctuations in abundance of individual fish species.

12.9.2.17 MacArthur Green (2019a) undertook a review of available evidence for red-throated diver displacement and concluded there would be little or no effect of displacement on diver survival. Consequently, this assessment presents red-throated diver mortality resulting from displacement as being between 1 and 10%, but with the most likely impact at the lower end of this scale.

MAGNITUDE OF IMPACT

All nonbreeding seasons

12.9.2.18 The impact of displacement and disturbance caused by construction disturbance and associated vessel traffic on red-throated divers during the autumn migration, mid-winter period and spring migration is predicted to be of short term duration as a result of the Proposed Development with a high probability of occurrence.

12.9.2.19 During the autumn migration at a seasonal peak density of 1.37 birds/km^2 (corridor 1) and 0.62 birds/km^2 (corridor 2) with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 17.2 individuals (1.37 x 12.56), could be at risk of displacement. This means that between 0.2 (1%) to 1.7 (10%) birds are at risk of mortality (Table 12.23).

12.9.2.20 During the winter at a seasonal peak density of 3.77 birds/km^2 with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 47.4 individuals (3.77 x 12.56) could be at risk of displacement. This means that between 0.5 (1%) and 4.7 (10%) birds are at risk of mortality (Table 12.23).

12.9.2.21 During the spring migration at a seasonal peak density of 0.21 birds/km^2 in December with a 2 km radius of disturbance around a cable laying vessel (12.56 km2), a maximum of 2.6 individuals (0.21 x 12.56) could be at risk of displacement. This means that between 0.03 (1%) and 0.3 (10%) birds are at risk of mortality (Table 12.23).

12.9.2.22 Across all nonbreeding seasons combined 67.2 individuals would be predicted to be at risk of displacement. This means that between 0.7 (1%) and 6.7 (10%) birds are at risk of mortality in both corridors (Table 12.23).

12.9.2.23 Assessed against the seasonal BDMPS populations, these levels of mortality would result in increases of between 0.001 and 0.50 (Table 12.23). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022).

12.9.2.24 The impact of displacement and disturbance caused by construction activities and associated vessel traffic on red-throated divers during autumn migration, the mid-winter period, spring migration and combined across all three is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF RED-THROATED DIVERS

12.9.2.25 Red-throated divers are considered to have little tolerance for disturbance and displacement as they are notoriously shy and prone to avoiding disturbed areas (Garthe and Hüppop, 2004; Petersen *et al*., 2006; Furness and Wade, 2012; Percival, 2014; Dierschke *et al.*, 2016; Dierschke *et al*., 2017). Any losses due to construction disturbance would be short term with rapid recovery following cessation of construction activity.

12.9.2.26 Red-throated divers are considered to have a medium conservation value as some of those migrating through the Irish Sea are likely to be connected to the Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA (8 km, 34 km and 99 km from the Array Area respectively) which are all designated for nonbreeding red-throated diver populations.

12.9.2.27 With respect to construction disturbance and associated vessel traffic, overall red-throated divers are considered to be of High sensitivity. This is due to a combination of low adaptability and low tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.9.2.28 Overall, for the maximum of two years of cable installation (including two winter periods and four migration seasons) the magnitude of the impact has been assessed as **Negligible** to **Low** and the sensitivity of red-throated divers is considered to be **High**. The effect across the nonbreeding period will therefore be **Not Significant** to **Moderate.** Overall in EIA terms this is considered to be **not significant.**

12.9.2.29 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Table 12.23: Magnitude of construction impact for red-throated divers in the Cable Corridor and Working Area

Season	Autumn	Winter	Spring	All Seasons
Peak density in each cable corridor (birds/km^2)[a]	1.37	3.77	0.21	-
No of individuals at risk of displacement [b]	17.2	47.4	2.6	67.2
No of individuals at risk of mortality (1 – 10%)[c]	0.2 – 1.7	0.5 – 4.7	0.03 – 0.3	0.7 – 6.7
BDMPS (individuals)[d]	18,280	4,148	18,280	18,280
Baseline mortality rate[e]	0.228	0.228	0.228	0.228
Natural mortality [f]	4,168	946	4,168	4,168
Increase in mortality rate (%)[g]	0.004-0.08	0.05-0.50	0.001-0.006	0.016-0.16
Magnitude	Negligible to Low	Negligible to Low	Negligible to Low	Negligible to Low
Sensitivity	High	High	High	High
Effect of Significance	Not Significant to Moderate	Not Significant to Moderate	Not Significant to Moderate	Not Significant to Moderate
Overall in EIA terms	Not Significant	Not Significant	Not Significant	Not Significant

a Seasonal peak density within the Cable Corridor and Working Area. Peak month is specified in parentheses for each season.
b Number of birds at risk of displacement in each season is calculated as the peak density multiplied by the area around one cable laying vessel with a 2 km radius (12.56 km^2). Number of birds at risk of displacement in All Seasons is a sum of each season.
c Risk of mortality is calculated as 1 and 10% of the number of birds at risk of displacement.
d Refer to Table 12.11
e Refer to Table 12.14 for baseline mortality rates
f Natural mortality is calculated as the BDMPS multiplied by the baseline mortality rate.
g Increase in mortality rate is calculated as the % increase in the natural mortality rate caused by the additional mortality.

ARRAY AREA

ALL NONBREEDING SEASONS

12.9.2.30 Red-throated divers were recorded in the Array Area in low numbers between January to May and October to December with none present between June to September. Density in the Array Area peaked in January (2.52 birds/km^2).

12.9.2.31 There is potential for disturbance and displacement of red-throated divers due to construction activity within the Array Area, including wind turbine installation and associated vessel traffic. However, construction will not occur across the whole of the Array Area simultaneously or every

day but will be phased with a maximum of one foundation expected to be installed at any one time. Consequently, the effects will occur only in the areas where vessels are operating at any given point and not across the entire Array Area.

12.9.2.32 As a precautionary assumption, the area from which birds could be displaced has been defined as a circle with a 2 km radius around a foundation, which is 12.56 km^2. This assumes that there would be 100% displacement of red-throated divers within the 2 km buffer surrounding a construction location (Garthe and Hüppop 2004; Schwemmer *et al.*, 2011) and that between 1% (evidence based precautionary rate, MacArthur Green 2019a) and 10% (Natural England's preferred precautionary value) of displaced individuals could be at risk of mortality as a result of displacement by construction disturbance.

Magnitude of impact

12.9.2.33 The impact of displacement and disturbance caused by construction disturbance and associated vessel traffic on red-throated divers during the autumn migration, mid-winter period and spring migration is predicted to be of short term duration as a result of the Proposed Development with a high probability of occurrence.

12.9.2.34 During the autumn migration at a seasonal peak density of 0.62 birds/km^2 in October with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 7.8 individuals (0.62 x 12.56). This means that between 0.08 (1%) and 0.0.78 (10%) birds are at risk of mortality (Table 12.24).

12.9.2.35 During the winter at a seasonal peak density of 2.52 birds/km^2 in January with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 31.7 individuals (2.52 x 12.56). This means that between 0.32 (1%) and 3.17 (10%) birds are at risk of mortality (Table 12.24).

12.9.2.36 During the spring migration at a seasonal peak density of 0.72 birds/km^2 in February with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 9 individuals (1.39 x 12.56). This means that between 0.09 (1%) and 0.9 (10%) birds are at risk of mortality (Table 12.24).

12.9.2.37 Across all nonbreeding seasons combined 64.2 individuals would be predicted to be at risk of displacement. This means that between 0.64 (1%) and 6.4 (10%) birds are at risk of mortality (Table 12.24).

12.9.2.38 Assessed against the seasonal BDMPS populations, these levels of mortality would result in increases of between 0.03 and 0.23 (Table 12.24). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022).

12.9.2.39 During autumn migration, the mid-winter period, spring migration and combined across all three the increase in mortality rate associated with displacement and disturbance is below the predicted 1% threshold for detectability (Table 12.24). Thus, even using a highly precautionary 10% mortality rate for displaced birds the effect would be undetectable against background variations.

12.9.2.40 The impact of displacement and disturbance caused by construction activities and associated vessel traffic on red-throated divers during autumn migration, the mid-winter period and spring migration is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible to Low.

Sensitivity of red-throated divers

12.9.2.41 Red-throated divers are considered to have little tolerance for disturbance and displacement as they are notoriously shy and prone to avoiding disturbed areas (Garthe and Hüppop, 2004; Petersen *et al.*, 2006; Furness and Wade, 2012; Percival, 2014; Dierschke *et al.*, 2016; Dierschke *et al.*, 2017). Any losses due to construction disturbance would be short term with rapid recovery following cessation of construction activity.

12.9.2.42 Red-throated divers are considered to have a medium conservation value as some of those migrating through the Irish Sea are likely to be connected to the Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA (minimum of 8 km, 34 km and 99 km from the Array Area respectively) which are all designated for nonbreeding red-throated diver populations.

12.9.2.43 With respect to construction disturbance and associated vessel traffic, overall red-throated divers are considered to be of High sensitivity. This is due to a combination of low adaptability and low tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

Significance of the effect

12.9.2.44 Overall, for the maximum of two years of turbine installation (including two winter periods and four migration seasons) the magnitude of the impact has been assessed as **Negligible** to **Low** and the sensitivity of red-throated divers is considered to be **High**. The effect will, therefore, be **Not Significant** to **Moderate.** Overall in EIA terms this is considered to be **not significant.**

12.9.2.45 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Table 12.24: Magnitude of construction impact for red-throated divers in the Array Area

Season	Autumn	Winter	Spring	All Seasons
Peak density (birds/km^2)[a]	0.62 (October)	2.52 (January)	1.97 (February)	NA
No of individuals at risk of displacement [b]	7.8	31.7	24.7	64.2
No of individuals at risk of mortality (1 – 10%)[c]	0.08 - 0.78	0.32 – 3.17	0.25 – 2.47	0.64 – 6.42
BDMPS (individuals)[d]	18,280	4,148	18,280	18,280
Baseline mortality rate[e]	0.228	0.228	0.228	0.228
Natural mortality [f]	4,168	946	4,168	4,168
Increase in mortality rate (%)[g]	0.019	0.33	0.06	0.15
Magnitude	Negligible to Low	Low	Negligible to Low	Low
Sensitivity	High	High	High	High
Significance of Effect	Not Significant to Moderate	Moderate	Not Significant to Moderate	Moderate
Overall in EIA terms	Not Significant	Not Significant	Not Significant	Not Significant

a Seasonal peak density within the Array Area. Peak month is specified in parentheses for each season.
b Number of birds at risk of displacement in each season is calculated as the peak density multiplied by the area around one construction location with a 2 km radius (12.56 km^2). Number of birds at risk of displacement in All Seasons is a sum of each season.
c Risk of mortality is calculated as 1 and 10% of the number of birds at risk of displacement.
d Refer to Table 12.11.
e Refer to Table 12.14 for baseline mortality rates

f Natural mortality is calculated as the BDMPS multiplied by the baseline mortality rate.
g Increase in mortality rate is calculated as the % increase in the natural mortality rate caused by the additional mortality.

GUILLEMOT

CABLE CORRIDOR AND WORKING AREA

12.9.2.46 There is potential for disturbance and displacement of nonbreeding guillemots resulting from the presence of vessels installing the export cables along the Cable Corridor and Working Area. Guillemots were recorded within the Cable Corridor and Working Area in all months, although numbers were low outside of the nonbreeding season.

12.9.2.47 In order to calculate the number of guillemots that potentially would be at risk of displacement from the Cable Corridor and Working Area during the cable laying process, the density of this species in the Cable Corridor and Working Area was estimated from the site-specific surveys carried out for the Proposed Development (refer to section 12.5.2.7 and Volume III, Appendix 12.1: Offshore Ornithology Technical Report (Revised March 2026)). Site-specific surveys indicated that guillemot densities within the Cable Corridor and Working Area peaked in November. Peak guillemot density was 25.4 birds/km^2 in corridor 1 and 12.2 birds/km^2 in corridor 2.

12.9.2.48 As a precautionary assumption, the area from which birds could be displaced is defined as a circle with a 2 km radius around each primary cable laying vessel, which is 12.56 km^2. Natural England and NatureScot differ in the predicted rates of displacement and mortality recommended for assessing potential impacts on auks. Natural England assume there would be 100% displacement of auks within the 2 km buffer surrounding the cable laying vessel combined with consequent mortalities for displaced birds between 1% and 10%. In contrast, NatureScot, with respect to displacement from array areas, recommend an auk displacement rate of 60% and consequent mortality (for displaced individuals) of 1-3% in the nonbreeding season and 3-5% in the breeding season.

12.9.2.49 MacArthur Green (2019b) undertook a review of available evidence for auk displacement which concluded that precautionary rates of displacement and mortality from operational windfarms would be 50% and 1% respectively. These figures are also considered suitably precautionary for the potential displacement around construction vessels. For this assessment the more precautionary rates of 60% and 1% have been assumed, noting that the impact is only in the vicinity of a vessel and temporary in nature, thereby ensuring the assessment conclusions are conservative in this regard.

MAGNITUDE OF IMPACT

Nonbreeding season

12.9.2.50 During the nonbreeding season (August to February), at a seasonal peak density of 25.4 birds/ km^2 (corridor 1) and 12.2 birds/ km^2 (corridor 2) and with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 191 individuals (25.43 x 12.56 x 60%) could be at risk of displacement along corridor 1 and 92 (12.2 x 12.56 x 60%) along corridor 2, 283 in total. This means that 2.8 individuals (1%) would be at risk of mortality due to cable installation (Table 12.25).

12.9.2.51 Assessed against the seasonal BDMPS population (1,139,220), this level of mortality would result in an increase of 0.002% in the background rate (Table 12.25). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.52 The impact of displacement and disturbance on guillemots within the Cable Corridor and Working Area during nonbreeding season is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with

this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Breeding season

12.9.2.53 During the breeding season (March to July), at a seasonal peak density of 15.2 birds/ km^2 (corridor 1) and 10.5 birds/ km^2 (corridor 2) and with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 114 individuals (15.2 x 12.56 x 60%) could be at risk of displacement along corridor 1 and 79 (10.5 x 12.56 x 60%) along corridor 2, 194 in total. This means that 2.0 individuals (1%) would be at risk of mortality due to cable installation (Table 12.25).

12.9.2.54 Assessed against the seasonal BDMPS populations (307,204 to 658,170), this level of mortality would result in an increase of no more than 0.005% in the background rate (Table 12.25). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.55 The impact of displacement and disturbance on guillemots within the Cable Corridor and Working Area during breeding season is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

All seasons

12.9.2.56 Across breeding and nonbreeding seasons combined 477 individuals would be predicted to be at risk of displacement (Table 12.25). Assessed against the largest BDMPS population (1,139,220), this level of mortality would result in an increase of 0.003% in the background rate (Table 12.25). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.57 The impact of displacement and disturbance on guillemots within the Cable Corridor and Working Area across all seasons is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GUILLEMOTS

12.9.2.58 Guillemots are considered to have a medium tolerance for the disturbance and displacement as they show some sensitivity to ship and helicopter traffic (Garthe and Hüppop 2004; Furness and Wade 2012; Furness *et al.*, 2013 and Bradbury *et al.*, 2014). Dierschke *et al.*, (2016) categorized guillemot as 'weakly avoiding offshore windfarms' based on a review of numbers inside and outside of operational offshore windfarms; their behavioural response to construction is likely to be similar and probably slightly stronger than during operation. However, any losses due to construction disturbance would be short term with rapid recovery following cessation of construction activity.

12.9.2.59 Guillemots are considered to have a high conservation value as many of those present in the Cable Corridor and Working Area are likely to be connected to the Ireland's Eye SPA and Lambay Island SPA (54 km and 62 km from the Array Area respectively) which are designated sites for breeding guillemot populations and are within mean maximum foraging range of the Proposed Development.

12.9.2.60 With respect to cable installation for all seasons, overall guillemots are considered to be of Medium sensitivity. This is due to a combination of low adaptability and low tolerance to vessel disturbance, rapid recoverability following cessation of the effect and medium to high conservation value since, as noted above, a proportion of the guillemots present in the Cable Corridor and Working Area may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.9.2.61 Overall, for the maximum of two years of construction (including two breeding and nonbreeding seasons) the magnitude of the impact has been assessed as **Negligible** and the sensitivity of guillemots is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.62 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Table 12.25: Magnitude of construction impact for guillemots in the Cable Corridor and Working Area

Season	Breeding	Nonbreeding	All Seasons
Peak density (birds/km^2)[a]	15.2 and 10.5	25.4 and 12.2	-
No of individuals at risk of displacement[b]	194	283	477
No of individuals at risk of mortality (1%)[c]	2.0	2.8	4.8
BDMPS (individuals)[d]	307,204 – 658,170	1,139,220	1,139,220
Baseline mortality rate[e]	0.140	0.140	0.140
Natural mortality[f]	43,008 – 92,144	159,491	159,491
Increase in mortality rate (%)[g]	0.002-0.005	0.002	0.003
Magnitude	Negligible	Negligible	Negligible
Sensitivity	Medium	Medium	Medium
Effect of Significance	Not Significant	Not Significant	Not Significant
Overall in EIA terms	Not Significant	Not Significant	Not Significant

a Seasonal peak density within the Cable Corridors and Working Areas. Peak month is specified in parentheses for each season.
b Number of birds at risk of displacement in each season is calculated as the peak density multiplied by the area one cable laying vessel with a 2 km radius (12.56 km^2) multiplied by 60%. Number of birds at risk of displacement in All Seasons is a sum of each season.
c Risk of mortality is calculated as 1% of the number of birds at risk of displacement.
d Refer to Table 12.11.
e Refer to Table 12.14 for baseline mortality rates.
f Natural mortality is calculated as the BDMPS multiplied by the baseline mortality rate.
g Increase in mortality rate is calculated as the % increase in the natural mortality rate caused by the additional mortality.

ARRAY AREA

12.9.2.63 There is potential for disturbance and displacement of guillemot due to construction activity within the Array Area, including wind turbine installation and associated vessel traffic. However, construction will not occur across the whole of the Array Area simultaneously or every day but will be phased with a maximum of one construction site (i.e. foundation location) expected to be active at any one time. Consequently, the effects will occur only in the areas where vessels are operating at any given point and not across the entire Array Area.

12.9.2.64 As a precautionary assumption, the area from which birds could be displaced has been defined as a circle with a 2 km radius around one foundation location, which is 12.56 km^2. For guillemots this assumes that 60% of auks will be at risk of displacement within the 2 km buffer surrounding a construction location and that the mortality of displaced birds will be 1% (NatureScot recommend auk displacement rates of 60% and consequent mortality for displaced individuals of 1%) in order to ensure the assessment conclusions are conservative in this regard.

12.9.2.65 Guillemots were recorded in the Array Area in all calendar months, with density peaking in May (49.6 birds/km^2) and at its lowest in March (0.4 birds/km^2).

MAGNITUDE OF IMPACT

Nonbreeding season

12.9.2.66 During the nonbreeding seasonal peak density of 38.7 birds/km^2 in January with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 292 individuals (38.7 x 12.56 x 60%) could be at risk of displacement. This means that 2.9 individuals (1%) would be at risk of mortality due to construction displacement (Table 12.26).

12.9.2.67 Assessed against the seasonal BDMPS populations (1,139,220), this level of mortality would result in an increase of 0.002% in the background rate (Table 12.26). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.68 The impact of displacement and disturbance caused by construction activities and associated vessel traffic on guillemots during the nonbreeding season is predicted to be of local spatial extent, short term duration, occurring only once but with high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population (i.e. a less than 1% increase in mortality rate Table 12.26). therefore, the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Breeding season

12.9.2.69 During the breeding season at a seasonal peak density of 49.6 birds/km^2 in May with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 374 individuals (49.6 x 12.56 x 60%) could be at risk of displacement. This means that 3.7 individuals (1%) would be at risk of mortality due to construction displacement (Table 12.26).

12.9.2.70 Assessed against the seasonal BDMPS populations (292,184 to 649,609), this level of mortality would result in an increase of no more than 0.009% in the background rate (Table 12.26). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.71 The impact of displacement and disturbance caused by construction activities and associated vessel traffic on guillemots during the breeding season is predicted to be of local spatial extent, short term duration, occurring only once but with high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population (i.e. a less than 1% increase in mortality rate Table 12.26). therefore, the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

All seasons

12.9.2.72 Across all seasons combined 666 individuals would be predicted to be at risk of displacement (Table 12.26). Assessed against the largest BDMPS populations (1,139,220), this level of mortality would result in an increase of 0.004% in the background rate (Table 12.26). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022).

12.9.2.73 The impact of displacement and disturbance caused by construction activities and associated vessel traffic on guillemots during the breeding, nonbreeding and across all seasons is predicted to be of local spatial extent, short term duration, occurring only once but with high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population (i.e. a less than 1% increase in mortality rate Table 12.26). therefore, the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GUILLEMOTS

12.9.2.74 Guillemots are considered to have a medium tolerance for disturbance and displacement as they show some sensitivity to ship and helicopter traffic (Garthe and Hüppop 2004; Furness and Wade 2012; Furness *et al.*, 2013 and Bradbury *et al.*, 2014). Dierschke *et al.*, (2016) categorized guillemot as 'weakly avoiding offshore windfarms' based on a review of numbers inside and outside of operational offshore windfarms; their behavioural response to construction is likely to be similar and probably slightly stronger than during operation. However, any losses due to construction disturbance would be short term with rapid recovery following cessation of construction activity.

12.9.2.75 Guillemots are considered to have a high conservation value as many of those present in the Array Area and 2 km buffer during the breeding season may be connected to the Ireland's Eye SPA and Lambay Island SPA (54 km and 62 km from the Array Area respectively) which are all designated sites for breeding guillemot populations and are within mean maximum foraging range of the Proposed Development for this species.

12.9.2.76 With respect to construction disturbance and associated vessel traffic, overall guillemots are considered to be of Medium sensitivity. This is due to a combination of low adaptability and low tolerance to disturbance, rapid recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the guillemots present in the Cable Corridor and Working Area may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.9.2.77 Overall, for the maximum of two years of turbine installation (including two breeding and nonbreeding seasons) the magnitude of the impact has been assessed as **Negligible** and the sensitivity of guillemots is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA term.

12.9.2.78 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Table 12.26: Magnitude of construction impact for guillemots in the Array Area

Season	Breeding	Nonbreeding	All Seasons
Peak density (birds/km^2)[a]	65.3 (May)	50.9 (January)	
No of individuals at risk of displacement[b]	492	384	876

Season	Breeding	Nonbreeding	All Seasons
No of individuals at risk of mortality (1%)[c]	4.9	3.8	8.8
BDMPS (individuals)[d]	307,204 – 658,170	1,139,220	1,139,220
Baseline mortality rate[e]	0.140	0.140	0.140
Natural mortality[f]	43,008 – 92,144	159,491	159,491
Increase in mortality rate (%)[g]	0.011-0.005	0.002	0.006
Magnitude	Negligible	Negligible	Negligible
Sensitivity	Medium	Medium	Medium
Effect of Significance	Not Significant	Not Significant	Not Significant
Overall in EIA terms	Not Significant	Not Significant	Not Significant

a Seasonal peak density within the Array Area. Peak month is specified in parentheses for each season.
b Number of birds at risk of displacement in each season is calculated as the peak density multiplied by the area around one construction location with a 2 km radius (12.56 km^2). Number of birds at risk of displacement in All Seasons is a sum of each season.
c Risk of mortality is calculated as 1 and 10% of the number of birds at risk of displacement.
d Refer to Table 12.11.
e Refer to Table 12.14 for baseline mortality rates
f Natural mortality is calculated as the BDMPS multiplied by the baseline mortality rate.
g Increase in mortality rate is calculated as the % increase in the natural mortality rate caused by the additional mortality.

RAZORBILL

CABLE CORRIDOR AND WORKING AREA

12.9.2.79 There is potential for disturbance and displacement of razorbills during breeding, autumn, winter and spring periods resulting from the presence of vessels installing the export cables along the Cable Corridor and Working Area.

12.9.2.80 Razorbills were recorded in all months in corridor 1 and corridor 2, and numbers were low outside of the nonbreeding season.

12.9.2.81 In order to calculate the number of razorbills that potentially would be at risk of displacement from the Cable Corridor and Working Area during the cable laying process, the density of this species in the Cable Corridor and Working Area (corridor 1 and corridor 2) was estimated from the site-specific surveys carried out for the Proposed Development (refer to section 12.5.2.7 and Volume III, Appendix 12.1: Offshore Ornithology Technical Report Overview (Revised March 2026)). Site-specific surveys indicated that razorbill densities within the Cable Corridor and Working Area peaked in November. Peak razorbill density was 8.2 birds/km^2 in Corridor 1 and 5.0 birds/km^2 in corridor 2.

12.9.2.82 As a precautionary assumption, the area from which birds could be displaced is defined as a circle with a 2 km radius around each primary cable laying vessel, which is 12.56 km^2. Natural England and NatureScot differ in the predicted rates of displacement and mortality recommended for assessing potential impacts on auks. Natural England assume there would be 100% displacement of auks within the 2 km buffer surrounding the cable laying vessel combined with

consequent mortalities for displaced birds between 1% and 10%. In contrast, NatureScot, with respect to displacement from array areas, recommend an auk displacement rate of 60% and consequent mortality (for displaced individuals) of 1-3% in the nonbreeding season and 3-5% in the breeding season.

12.9.2.83 MacArthur Green (2019b) undertook a review of available evidence for auk displacement which concluded that precautionary rates of displacement and mortality from operational windfarms would be 50% and 1% respectively. These figures are also considered suitably precautionary for the potential displacement around construction vessels. Therefore, the assessment presents estimates using a 60% displacement rate and a 1% mortality rate in order to ensure the assessment conclusions are conservative in this regard.

MAGNITUDE OF IMPACT

Autumn migration

12.9.2.84 During the autumn migration (August to October), at a seasonal peak density of 2.2 birds/ km^2 (corridor 1) and 2.7 birds/ km^2 (corridor 2), with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 16 individuals (2.2 x 12.56 x 60%) could be at risk of displacement along corridor 1 and 20 (2.7 x 12.56 x 60%) along corridor 2, 37 in total. This means that 0.4 individuals (1%) are at risk of mortality due to cable installation (Table 12.27).

12.9.2.85 Assessed against the seasonal BDMPS population (630,411), this level of mortality would result in an increase of 0.002% in the background rate (Table 12.27). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.86 The impact of displacement and disturbance on razorbills within the Cable Corridor and Working Area during the autumn migration is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Winter season

12.9.2.87 During the winter period (November and December), at a seasonal peak density of 8.2 birds/ km^2 (corridor 1) and 5.0 birds/ km^2 (corridor 2), with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 62.1 individuals (8.2 x 12.56 x 60%) could be at risk of displacement along corridor 1 and 36.7 (4.9.0 x 12.56 x 60%) along corridor 2, 99 in total. This means that 1.0 individuals (1%) are at risk of mortality due to cable installation (Table 12.27).

12.9.2.88 Assessed against the seasonal BDMPS population (364,919), this level of mortality would result in an increase of 0.002% in the background rate (Table 12.27). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.89 The impact of displacement and disturbance on razorbills within the Cable Corridor and Working Area during the winter period is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Spring season

12.9.2.90 During the spring migration (January to March), at a seasonal peak density of 0.0.66 birds/ km^2 (corridor 1) and 1.8 birds/ km^2 (corridor 2), with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 5 individuals (0.66 x 12.56 x 60%) could be at risk of

displacement along corridor 1 and 13 (1.8 x 12.56 x 60%) along corridor 2, 18 in total. This means that 0.2 individuals (1%) are at risk of mortality due to cable installation (Table 12.27).

12.9.2.91 Assessed against the seasonal BDMPS population (630,411), this level of mortality would result in an increase of <0.001% in the background rate (Table 12.27). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.92 The impact of displacement and disturbance on razorbills within the Cable Corridor and Working Area during the spring migration is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Breeding season

12.9.2.93 During the breeding season (April to July), at a seasonal peak density of 1.2 birds/ km^2 (corridor 1) and 0.5 birds/ km^2 (corridor 2) in November, with a 2 km radius of disturbance around a cable laying vessel (12.56 km^2), a maximum of 9 individuals (1.2 x 12.56 x 60%) could be at risk of displacement along corridor 1 and 4 (0.5 x 12.56 x 60%) along corridor 2, 13 in total. This means that 0.1 individuals (1%) are at risk of mortality due to cable installation (Table 12.27).

12.9.2.94 Assessed against the seasonal BDMPS populations (41,886 – 313,861), this level of mortality would result in an increase of no more than 0.002% in the background rate (Table 12.27). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022). Overall therefore, the magnitude is considered to be Negligible.

All seasons

12.9.2.95 Across all nonbreeding seasons combined 167 individuals would be predicted to be at risk of displacement (Table 12.27). Assessed against the largest BDMPS population (630,411), this level of mortality would result in an increase of 0.001% in the background rate (Table 12.27). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022).

12.9.2.96 The impact of displacement and disturbance on razorbills within the Cable Corridor and Working Area all seasons is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.97 Razorbills are considered to have a medium tolerance for the disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016). However, any losses due to construction disturbance would be short term with rapid recovery following cessation of construction activity.

12.9.2.98 Razorbills are considered to have a high conservation value as many of those present in the Cable Corridor and Working Area may be connected to the Ireland's Eye SPA, Lambay Island SPA and Saltee Islands SPA (54 km, 62 km and 80 km from the Array Area respectively) which are all designated sites for breeding razorbill populations and are within mean maximum foraging range of the Proposed Development.

12.9.2.99 With respect to cable installation, overall razorbills are considered to be of Medium sensitivity. This is due to a combination of low adaptability and low tolerance to vessel disturbance, rapid recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the razorbills present in the Cable Corridor and Working Area may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.9.2.100 Overall, for the maximum of two years of construction (including two winter periods, two breeding seasons and four migration seasons) the magnitude of the impact has been assessed as **Negligible** and the sensitivity razorbills is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.101 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Table 12.27: Magnitude of impact for razorbills in the Cable Corridor and Working Area

Season	Breeding	Autumn	Winter	Spring	All Seasons
Peak density (birds/km^2)[a]	1.24 and 0.51	2.17 and 2.69	8.24 and 4.86	0.66 and 1.80	-
No of individuals at risk of displacement[b]	13.1	36.7	98.7	18.5	167
No of individuals at risk of mortality (1%)[c]	0.1	0.4	1.0	0.2	1.7
BDMPS (individuals)[d]	41,886 – 313,861	630,411	364,919	630,411	630,411
Baseline mortality rate[e]	0.174	0.174	0.174	0.174	0.174
Natural mortality[f]	7,288 – 54,612	109,692	63,496	109,692	109,692
Increase in mortality rate (%)[g]	0.002 – 0.0002	0.003	0.002	<0.001	0.001
Magnitude	Negligible	Negligible	Negligible	Negligible	Negligible
Sensitivity	Medium	Medium	Medium	Medium	Medium
Effect of Significance	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Overall in EIA terms	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

a Seasonal peak density within the Cable Corridors and Woking Areas. Peak month is specified in parentheses for each season.
b Number of birds at risk of displacement in each season is calculated as the peak density multiplied by the area one cable laying vessel with a 2 km radius (12.56 km^2) multiplied by 60%. Number of birds at risk of displacement in All Seasons is a sum of each season.
c Risk of mortality is calculated as 1% of the number of birds at risk of displacement.
d Refer to

Table *12.11*.
e Refer to *Table 12.14* for baseline mortality rates.
f Natural mortality is calculated as the BDMPS multiplied by the baseline mortality rate.
g Increase in mortality rate is calculated as the % increase in the natural mortality rate caused by the additional mortality.

ARRAY AREA

12.9.2.102 There is potential for disturbance and displacement of razorbill due to construction activity within the Array Area, including wind turbine installation and associated vessel traffic. However, construction will not occur across the whole of the Array Area simultaneously or every day but will be phased with a maximum of one construction site (i.e. foundation location) expected to be active at any one time. Consequently, the effects will occur only in the areas where vessels are operating at any given point and not across the entire Array Area.

12.9.2.103 As a precautionary assumption, the area from which birds could be displaced has been defined as a circle with a 2 km radius around one foundation location, which is 12.56 km^2. For razorbills this assumes that 60% of auks will be at risk of displacement within the 2 km buffer surrounding a construction location and that the mortality of displaced birds will be 1% (NatureScot recommend auk displacement rates of 60% and consequent mortality for displaced individuals of 1%).

12.9.2.104 MacArthur Green (2019b) undertook a review of available evidence for auk displacement which concluded that precautionary rates of displacement and mortality from operational windfarms would be 50% and 1% respectively (i.e. very similar to those advised by NatureScot). These figures are also considered suitably precautionary for the potential displacement around construction vessels. Therefore, the assessment presents estimates using a 60% displacement rate and a 1% mortality rate in order to ensure the assessment conclusions are conservative in this regard.

12.9.2.105 Razorbills were recorded in the Array Area in all calendar months, with density peaking in January (51.17 birds/km^2) and at its lowest in July (0.1 birds/km^2).

MAGNITUDE OF IMPACT

Autumn migration

12.9.2.106 During the autumn migration peak density of 12.4 birds/km^2 in January with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 94 individuals (12.4 x 12.56 x 60%). This means that 1.0 individuals (1%) would be at risk of mortality due to cable installation (Table 12.28).

12.9.2.107 Assessed against the seasonal BDMPS population (630,411), this level of mortality would result in an increase of <0.001% in the background rate (Table 12.28). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.108 The impact of displacement and disturbance caused by construction activities and associated vessel traffic during the autumn migration is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Winter season

12.9.2.109 During the winter period peak density of 34.0 birds/km^2 in January with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 257 individuals (34.0 x 12.56 x 60%). This means that 2.6 individuals (1%) would be at risk of mortality due to cable installation (Table 12.28).

12.9.2.110 Assessed against the seasonal BDMPS population (364,919), this level of mortality would result in an increase of 0.004% in the background rate (Table 12.28). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.111 The impact of displacement and disturbance caused by construction activities and associated vessel traffic during the winter period is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Spring season

12.9.2.112 During the spring period peak density of 46.0 birds/km^2 in January with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 346 individuals (46.0 x 12.56 x 60%). This means that3.5 individuals (1%) would be at risk of mortality due to cable installation (Table 12.28).

12.9.2.113 Assessed against the seasonal BDMPS population (630,411), this level of mortality would result in an increase of 0.003% in the background rate (Table 12.28). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022).

12.9.2.114 The impact of displacement and disturbance caused by construction activities and associated vessel traffic during the spring migration is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

Breeding season

12.9.2.115 During the breeding season peak density of 3.2 birds/km^2 in January with a 2 km radius of disturbance in the Array Area (12.56 km^2), a maximum of 24 individuals (3.2 x 12.56 x 60%). This means that 0.2 individuals (1%) would be at risk of mortality due to cable installation (Table 12.28).

12.9.2.116 Assessed against the seasonal BDMPS populations (35,965 – 310,486), this level of mortality would result in an increase of no more than 0.004% in the background rate (Table 12.28). Increases of less than 1% are considered undetectable against natural variations (Parker *et al.* 2022).

12.9.2.117 The impact of displacement and disturbance caused by construction activities and associated vessel traffic during the spring migration is predicted to be of local spatial extent, short term duration, continuous and high reversibility, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

All seasons

12.9.2.118 Across all nonbreeding seasons combined 721 individuals would be predicted to be at risk of displacement (Table 12.28). Assessed against the largest BDMPS population (630,411), this level of mortality would result in an increase of 0.007% in the background rate (Table 12.28). Increases of less than 1% are considered undetectable against natural variations.

12.9.2.119 The impact of displacement and disturbance caused by construction activities and associated vessel traffic on razorbills during the breeding season, autumn migration, winter period and spring migration and across seasons is predicted to be of local spatial extent, short term duration, occurring only once but with high probability. However, the increase in mortality

associated with this impact is considered to have an undetectable effect on the population (i.e. a less than 1% increase in mortality rate Table 12.28), therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.120 Razorbills are considered to have a medium tolerance for disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016). However, any losses due to construction disturbance would be short term with rapid recovery following cessation of construction activity.

12.9.2.121 Razorbills are considered to have a high conservation value as many of those present in the Array Area and 2 km buffer may be connected to the Ireland's Eye SPA, Lambay Island SPA and Saltee Islands SPA (54 km, 62 km and 80 km from the Array Area respectively) which are all designated sites for breeding razorbill populations and are within mean maximum foraging range of the Proposed Development.

12.9.2.122 With respect to construction disturbance and associated vessel traffic, overall razorbills are considered to be of Medium sensitivity. This is due to a combination of low adaptability and low tolerance to disturbance, rapid recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the razorbills present in the Cable Corridor and Working Area may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.9.2.123 Overall, for the maximum of two years of construction (including two winter periods, two breeding seasons and four migration seasons) the magnitude of the impact has been assessed as **Negligible** and the sensitivity of razorbills is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.124 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Table 12.28: Magnitude of impact for razorbills in the Array Area

Season	Breeding	Autumn	Winter	Spring	All Seasons
Peak density (birds/km^2)[a]	3.21 (April)	12.42 (August)	34.0 (Nov)	46.0 (Jan)	
No of individuals at risk of displacement[b]	24	94	257	346	721
No of individuals at risk of mortality (1%)[c]	0.2	0.9	2.6	3.5	7.2
BDMPS (individuals)[d]	35,965 – 310,486	630,411	364,919	630,411	630,411
Baseline mortality rate[e]	0.174	0.174	0.174	0.174	0.174
Natural mortality[f]	6,258 – 54,025	109,692	63,496	109,692	109,692

Season	Breeding	Autumn	Winter	Spring	All Seasons
Increase in mortality rate (%)[g]	0.004-<0.001	<0.001	0.004	0.003	0.007
Magnitude	Negligible	Negligible	Negligible	Negligible	Negligible
Sensitivity	Medium	Medium	Medium	Medium	Medium
Effect of Significance	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Overall in EIA terms	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

a Seasonal peak density within the Array Area. Peak month is specified in parentheses for each season.
b Number of birds at risk of displacement in each season is calculated as the peak density multiplied by the area around one construction location with a 2 km radius (12.56 km^2). Number of birds at risk of displacement in All Seasons is a sum of each season.
c Risk of mortality is calculated as 1 and 10% of the number of birds at risk of displacement.
d Refer to *Table 12.11*.
e Refer to Table 12.14 for baseline mortality rates
f Natural mortality is calculated as the BDMPS multiplied by the baseline mortality rate.
g Increase in mortality rate is calculated as the % increase in the natural mortality rate caused by the additional mortality.

Operational and maintenance phase

12.9.2.125 Vessel and helicopter activity during the operational and maintenance phase within the Array Area has the potential to directly affect bird populations through disturbance, leading to displacement of birds from the Array Area.

12.9.2.126 However, any effects generated during the operational phase from vessel and helicopter activity alone are expected to be of a reduced magnitude compared with those generated during the construction phase, as vessel activity will be of a lower level than that associated with turbine construction.

12.9.2.127 The impact of disturbance and displacement resulting from maintenance activities (including vessel and helicopter activity) combined with that from the operational turbines themselves are assessed below.

12.9.2.128 The presence of operational infrastructure has the potential to directly displace birds from important areas for feeding, moulting and loafing during the operational and maintenance phase. The consequence of such displacement could potentially result in a loss of fitness, lower reproductive success and reduced survival. This would be unlikely for seabirds that have large area of alternative habitat available but might be more likely to affect seabirds with highly specialised habitat requirements that are limited in availability (Furness *et al.*, 2013; Bradbury *et al.*, 2014).

12.9.2.129 The impact of operational infrastructure and maintenance activities may continuously affect breeding and nonbreeding birds foraging within the Array Area but may only affect passage birds intermittently during migration.

12.9.2.130 Seabird species vary in their reactions to the presence of operational infrastructure and to the maintenance activities (particularly ship and helicopter traffic) that are associated with them. For example, vessel activity and the lights on wind turbines and associated ancillary structures can directly attract (or repel) certain species of birds and affect migratory behaviour on a local scale. Garthe and Hüppop (2004) presented a scoring system for disturbance factors such as ship and helicopter traffic, which is used widely in offshore windfarm EIAs. Dierschke *et al.*, (2016)

reviewed all available evidence from operational offshore windfarms on the extent of displacement or attraction of seabirds in relation to these structures. They found strong avoidance of operational offshore windfarms by great crested grebe, red-throated diver, black-throated diver and gannet. They found weak avoidance by long-tailed duck, common scoter, fulmar, Manx shearwater, razorbill, guillemot, little gull and Sandwich tern. They found no evidence of any consistent response by eider, kittiwake, common tern and Arctic tern, and evidence of weak attraction to operating offshore windfarms for common gull, black-headed gull, great black-backed gull, herring gull, lesser black-backed gull and red-breasted merganser, and strong attraction for shags and cormorants. Dierschke *et al.*, (2016) suggested that strong avoidance would lead to some habitat loss for those species, while attracted birds appear to benefit from increases in food abundance within operational offshore windfarms.

12.9.2.131 Post-construction monitoring of the Beatrice windfarm (MacArthur Green 2023, Trinder et al. 2024) has found no indication of windfarm avoidance behaviour in breeding kittiwake (see also Volume III, Appendix 12.13: Offshore Ornithology Technical Report - Kittiwake Displacement Evidence Review (RFI March 2026) for more details on kittiwake studies at operational wind farms), guillemot, razorbill and puffin from the nearby East Caithness Cliffs SPA, however gannet abundance in the windfarm was markedly reduced following turbine installation.

12.9.2.132 There are a number of different measures used to determine bird displacement from areas of sea in response to activities associated with an offshore windfarm. Furness *et al.*, (2013), for example, use disturbance ratings for particular species, alongside scores for habitat flexibility and conservation importance to define an index value that highlights the sensitivity to disturbance and displacement. These authors also recognise that displacement may contribute to individual birds experiencing fitness consequences, which at an extreme level could lead to the mortality of individuals.

12.9.2.133 As offshore windfarms are a relatively new feature in the marine environment, there is limited empirical data on displacement of foraging seabirds from offshore windfarms; the consequence is that assessment of the amount of displacement arising from new developments can be speculative. However, displacement advice is available from the UK Statutory Nature Conservation Bodies (SNCBs) who issued a joint Interim Displacement Advice Note (JNCC *et al.*, 2017) providing recommendations on how to present information to enable the assessment of displacement effects in relation to offshore windfarm developments. This advice note has been used in the assessment provided below.

12.9.2.134 The methodology presented in JNCC *et al.* (2017) recommends that a matrix is presented for each key species for the most relevant biological periods showing bird losses at differing rates of displacement and mortality. This assessment uses the range of predicted losses, in association with the scientific evidence available from post-construction monitoring studies, to quantify the level of displacement and the potential losses as a consequence of the Proposed Development. These losses are then placed in the context of the relevant population (e.g. SPA, BDMPS or biogeographic) to determine the magnitude of effect.

12.9.2.135 The population estimate used for each species to assess the displacement effects was the relevant seasonal peak within a biological season (i.e. the highest value for the months within each season). The seasonal peaks were calculated as follows; first the density for each calendar month was calculated (as the average of the density in each survey undertaken in that month), then the highest value from the months within each season extracted. As per JNCC *et al.* (2017), for divers, the assessment used all data recorded within the 4 km buffer, for all other species the assessment used all data recorded within the 2 km buffer (although it should be noted that the evidence reviews in MacArthur Green 2019a and 2019b indicate that these buffer distances are highly precautionary for both divers and auks).

12.9.2.136 Birds are considered to be most at risk from operational disturbance and displacement effects when they are resident in an area (e.g. during the breeding season or wintering season).

The small risk of impact to migrating birds is better considered in terms of potential barrier effects. However, JNCC (2017) suggests that migration periods should also be assessed using the matrix approach and this has been undertaken where appropriate.

12.9.2.137 The focus of this section is on the disturbance and displacement of birds due to the presence and operation of wind turbines, other offshore infrastructure (e.g. the offshore substation platforms) and any maintenance operations associated with these structures. Following installation of the inter-array, interconnector and offshore export cables, the required operational and maintenance activities (in relation to the cable) may have short-term and localised disturbance and displacement impacts on birds using the Array Area. However, disturbance from operational cable activities (e.g. maintenance) would be temporary and localised, and is unlikely to result in detectable effects at either the local or regional population level. Therefore, no impact due to cable operation and maintenance is predicted.

12.9.2.138 In order to focus the assessment of disturbance and displacement, a screening exercise was undertaken to identify those species most likely to be at risk (Table 12.29) focussing on the main species described in Volume III, Appendix 12.1: Offshore Ornithology Technical Report Overview (Revised March 2026). The species identified as at risk were then assessed within the biological seasons within which effects were potentially likely to occur. Species with a low sensitivity to displacement or recorded only in very small numbers within the Array Area during the breeding and wintering seasons, were screened out of further assessment (Table 12.29) on the basis of the general sensitivity to disturbance and displacement for each species (ordered according to their sensitivity to disturbance and displacement).

Table 12.29: Operational disturbance and displacement screening

Receptor	Sensitivity to Disturbance and Displacement (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.,* 2016, Dierschke *et al.,* 2016)	Biological Season(s) with peak number within the Array Area	Screening Result (IN or OUT)
Common scoter	Very High	Nonbreeding season	**Screened OUT** as present in very low numbers in few months.
Red-throated diver	Very High	Nonbreeding and spring migration	**Screened IN** for potential effects during autumn migration, mid-winter and spring migration as very high sensitivity to disturbance.
Great northern diver	Very High	Nonbreeding season	**Screened OUT** as present in very low numbers in few months.
Cormorant	High	Nonbreeding season	**Screened OUT** as present in very low numbers in few months.
Fulmar	Considered Low in some studies, but possibly high according to Dierschke *et al.,* (2016)	Autumn migration	**Screened OUT** as present in very low numbers and the species has a very high habitat flexibility score (Furness and Wade, 2012), due to species utilising a wide range of habitats over large areas.

Receptor	Sensitivity to Disturbance and Displacement (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.,* 2016, Dierschke *et al.,* 2016)	Biological Season(s) with peak number within the Array Area	Screening Result (IN or OUT)
Gannet	Considered Low in some studies, but possibly high according to Dierschke *et al.,* (2016)	Autumn migration	**Screened IN** for autumn and spring migration seasons, as has a high macro avoidance rate.
Guillemot	Medium	Migration periods	**Screened IN** as present in moderate numbers in nonbreeding season and due to medium sensitivity to disturbance and displacement.
Razorbill	Medium	Spring migration season	**Screened IN** as present in moderate numbers during nonbreeding season and due to medium sensitivity to disturbance and displacement.
Shag	Medium	Breeding season	**Screened OUT** as present in very low numbers in few months.
Puffin	Low to medium	Spring migration season	**Screened OUT** as present in low numbers and due to low sensitivity to disturbance and displacement.
Arctic tern	Low to medium	Autumn migration	**Screened OUT** as has low sensitivity to disturbance and displacement and presence indicative of migratory movements.
Common tern	Low to medium	Autumn migration	**Screened OUT** as has low sensitivity to disturbance and displacement and presence indicative of migratory movements.
Sandwich tern	Low to medium	Autumn migration	**Screened OUT** as present in low numbers.
Arctic skua	Low	N/A	**Screened OUT** as has low sensitivity to disturbance and displacement and no birds recorded within Array Area.
Black-headed gull	Low	Nonbreeding	**Screened OUT** as has low sensitivity to disturbance and displacement.
Common gull	Low	Nonbreeding	**Screened OUT** as has low sensitivity to disturbance and displacement.
Little gull	Low	Nonbreeding	**Screened OUT** as has low sensitivity to disturbance and displacement.

Receptor	Sensitivity to Disturbance and Displacement (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.,* 2016, Dierschke *et al.,* 2016)	Biological Season(s) with peak number within the Array Area	Screening Result (IN or OUT)
Kittiwake	Low	Nonbreeding	**Screened OUT** as not known to avoid wind turbines (low macro avoidance rate) and shows low displacement at operational windfarms.
Lesser black-backed gull	Low	N/A	**Screened OUT** as present in very low numbers in all seasons and not known to avoid wind turbines (low macro avoidance rate).
Herring gull	Low	Migration periods	**Screened OUT** as present in low numbers in all seasons and not known to avoid wind turbines (low macro avoidance rate).
Great black-backed gull	Low	Nonbreeding season	**Screened OUT** as present in low numbers and not known to avoid wind turbines (low macro avoidance rate).
Manx shearwater	Low	Breeding	**Screened OUT** as has low sensitivity to disturbance and displacement.

RED-THROATED DIVER

12.9.2.139 The assumption for red-throated diver is that displacement will occur at a constant level to a distance of 4 km from the Array Area and that within this area, 100% of birds will be displaced and mortality of displaced birds will be up to 10% in line with guidance (JNCC *et al.*, 2017).

12.9.2.140 However, this approach to displacement assessment is considered to be over-precautionary since it combines high values for three aspects of the assessment: the distance over which birds will be affected (4 km), the rate of displacement within this distance (100%) and the mortality rate of displaced individuals (10%). Further consideration of these aspects for red-throated divers are provided below.

12.9.2.141 Monitoring studies of red-throated divers at the Kentish Flats offshore windfarm found an observable shift of birds away from the turbines, particularly within 500 m of the site (Percival, 2010). This is consistent with a study of pre-construction and post-construction abundance and distribution of birds conducted at Horns Rev, Denmark. This study found that red-throated divers avoided areas of sea that were apparently suitable (favoured habitat, suitable depth and abundant food sources) following the construction of an offshore windfarm, and that this effect remained for a period of three years (Petersen *et al.*, 2006). Further pre-construction and post-construction abundance and distribution studies published more recently on red-throated divers at the Kentish Flats site (Percival, 2014) have provided displacement values for both the site footprint and within distance bands away from the site boundary and indicate how displacement has changed over the periods following construction.

12.9.2.142 Studies at Kentish Flats and Thanet have provided evidence that red-throated divers are displaced to a decreasing extent with increasing distance from wind turbines (Percival, 2013, 2014). Percival (2014) reported that at Kentish Flats, while displacement within the windfarm boundary was around 80% (compared to pre-construction), this declined to 10% at 1 km from the windfarm and was 0% from 2 km. A similar within windfarm reduction in density was reported at Thanet, but there was no detectable displacement beyond the windfarm boundary (Percival, 2013). Displacement rates of 60% to 80% were reported for OWEZ (Leopold *et al.*, 2011) and the review by Dierschke *et al.*, (2016) also suggested a figure in this range. The 4 km exclusion distance is greater than the evidence suggests is required for this species, and it is therefore considered over-precautionary to combine this with a displacement rate as high as 100%.

12.9.2.143 A review of evidence undertaken by a panel of experts brought together by JNCC concluded that mortality associated with displacement of red-throated divers may well be zero (Dierschke *et al.*, 2017) and is certainly very unlikely to be as high as 10%. This conclusion is also supported by modelling of individual energy budgets (Topping and Petersen, 2011).

12.9.2.144 MacArthur Green (2019a) undertook a comprehensive literature review investigating displacement impacts on red-throated divers. On the basis of the evidence, this review advocated a displacement rate of 90% extending 2 km from the windfarm boundary with a consequent maximum mortality rate of 1%.

12.9.2.145 Therefore, this assessment presents displacement across a range from 90% displaced and 1% mortality (evidence based) to 100% displaced and 10% mortality. It should be noted that the evidence-based values still retain precaution, not only in the interpretation of the evidence to derive the rates, but also in the use of a 4 km buffer around the windfarm, despite the evidence that 2 km would be a sufficiently precautionary distance.

12.9.2.146 The displacement matrices in Table 12.30 to Table 12.32 have been populated with data for red-throated diver during the autumn migration, nonbreeding and spring migration periods within the Array Area and 4 km buffer. These tables present displacement from 0 to 100% at 10% increments and mortality from 0 to 100% at 1% increments up to 10% and larger gaps thereafter. Shading has been used to highlight the 90 to 100% displacement and 1 to 10% mortality ranges.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING AUTUMN MIGRATION

12.9.2.147 Using the seasonal peak autumn migration abundance within the Array Area and 4 km buffer of 40 birds, the predicted number of individual red-throated divers which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between zero (90% displaced and 1% mortality) and four (100% displaced and 10% mortality) individuals (Table 12.30).

Table 12.30: Displacement matrix presenting the number of red-throated divers within the Array Area and 4 km buffer during the autumn migration season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	1	1	1	1
3	0	0	0	0	1	1	1	1	1	1
4	0	0	0	1	1	1	1	1	1	2
5	0	0	1	1	1	1	1	2	2	2

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
6	0	0	1	1	1	1	2	2	2	2
7	0	1	1	1	1	2	2	2	3	3
8	0	1	1	1	2	2	2	3	3	3
9	0	1	1	1	2	2	3	3	3	4
10	0	1	1	2	2	2	3	3	4	4
20	1	2	2	3	4	5	6	6	7	8
30	1	2	4	5	6	7	8	10	11	12
50	2	4	6	8	10	12	14	16	18	20
75	3	6	9	12	15	18	21	24	27	30
100	4	8	12	16	20	24	28	32	36	40

12.9.2.148 The autumn migration red-throated diver population was estimated to be 18,280 (Table 12.12). At the average baseline mortality rate for red-throated diver of 0.228 (Table 12.14), the natural mortality for this population is 4,167 (18,280 x 0.228). The addition of a maximum of four individuals to this would increase the mortality rate by up to 0.09% which would be undetectable.

12.9.2.149 The impact of displacement and disturbance from offshore infrastructure on red-throated divers during autumn migration is predicted to occur across the Array Area and 4km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Low.

SENSITIVITY OF RED-THROATED DIVERS

12.9.2.150 Red-throated divers are considered to have little tolerance for disturbance and displacement as they are notoriously shy and prone to avoiding disturbed areas (Garthe and Hüppop, 2004; Petersen *et al.*, 2006; Furness and Wade, 2012; Percival, 2014; Dierschke *et al.*, 2016; Dierschke *et al.*, 2017). However, although this species is likely to be disturbed and displaced within the Array Area, the degree of effect decreases with distance, with much lower levels of disturbance in areas further than 1 km from the Array Area (Percival, 2013, 2014; Dierschke *et al.*, 2016; Leopold *et al.*, 2011).

12.9.2.151 Red-throated divers are considered to have a medium conservation value as some of those migrating through the Irish Sea during autumn are likely to be connected to the Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA (10 km, 34 km and 99 km from the Array Area respectively) which are all designated for nonbreeding red-throated diver populations.

12.9.2.152 With respect to operational disturbance and displacement during autumn migration, overall red-throated divers are considered to be of Medium sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING AUTUMN MIGRATION

12.9.2.153 Overall, for displacement and disturbance from offshore infrastructure during autumn migration the magnitude has been assessed as **Low** and the sensitivity of red-throated diver is considered to be **Medium**. The effect will, therefore, **Slight adverse**, which is **not significant** in EIA terms.

12.9.2.154 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

WINTER SEASON

MAGNITUDE OF IMPACT DURING THE WINTER SEASON

12.9.2.155 Using the winter season peak abundance within the Array Area and 4 km buffer of 200 birds, the predicted number of individual red-throated divers which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between two (90% displaced and 1% mortality) and 20 (100% displaced and 10% mortality) individuals (Table 12.31).

Table 12.31: Displacement matrix presenting the number of red-throated divers within the Array Area and 4 km buffer during the winter period that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	1	1	1	1	1	2	2	2
2	0	1	1	2	2	2	3	3	4	4
3	1	1	2	2	3	4	4	5	5	6
4	1	2	2	3	4	5	6	6	7	8
5	1	2	3	4	5	6	7	8	9	10
6	1	2	4	5	6	7	8	10	11	12
7	1	3	4	6	7	8	10	11	13	14
8	2	3	5	6	8	10	11	13	14	16
9	2	4	5	7	9	11	13	14	16	18
10	2	4	6	8	10	12	14	16	18	20
20	4	8	12	16	20	24	28	32	36	40
30	6	12	18	24	30	36	42	48	54	60
50	10	20	30	40	50	60	70	80	90	100
75	15	30	45	60	75	90	105	120	135	150
100	20	40	60	80	100	120	140	160	180	200

12.9.2.156 The winter red-throated diver population was estimated to be 4,148 (Table 12.12). At the average baseline mortality rate for red-throated diver of 0.228 (Table 12.14), the natural mortality for this population is 946 (4,148 x 0.228). At the maximum predicted impact of 10% mortality, an additional 20 individuals would be at risk of mortality, which would raise the background rate by 2.1%. However, at a displacement mortality rate of 4% (i.e. just less than half of the maximum advised by Natural England), the consequence of displacement would increase the background mortality rate by less than 1% (i.e. would be undetectable). It is of note that in a review of evidence for red-throated diver displacement effects, a mortality rate for displaced birds of 1% was considered precautionary (MacArthur Green 2019a). Therefore, it is considered that the predicted magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.157 The impact of displacement and disturbance from offshore infrastructure on red-throated divers during the mid-winter period is predicted to occur across the Array Area and 4km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Medium.

SENSITIVITY OF RED-THROATED DIVERS

12.9.2.158 Red-throated divers are considered to have little tolerance for disturbance and displacement as they are notoriously shy and prone to avoiding disturbed areas (section 12.9.2.150).

12.9.2.159 Red-throated divers are considered to have a medium conservation value as some of those present during the winter period may be connected to the Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA (10 km, 34 km and 99 km from the Array Area respectively) which are all designated for nonbreeding red-throated diver populations.

12.9.2.160 With respect to operational disturbance and displacement during mid-winter, overall red-throated divers are considered to be of Medium sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT THE WINTER SEASON

12.9.2.161 Overall, for displacement and disturbance from offshore infrastructure during the mid-winter period the magnitude has been assessed as **Medium** and the sensitivity of red-throated diver is considered to be **Medium**. The effect will, therefore, **Moderate**, which is considered **not significant** in EIA terms.

12.9.2.162 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING SEASON

MAGNITUDE OF IMPACT DURING SPRING MIGRATION

12.9.2.163 Using the seasonal peak spring migration abundance within the Array Area and 4 km buffer of 152 birds, the predicted number of individual red-throated divers which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between one (90% displaced and 1% mortality) and 15 (100% displaced and 10% mortality) individuals (Table 12.32).

12.9.2.164 The spring red-throated diver population was estimated to be 18,280 (Table 12.12). At the average baseline mortality rate for red-throated diver of 0.228 (Table 12.14) the natural mortality for this population is 4,167 (18,280 x 0.228). The addition of a maximum of 15 individuals to this would increase the mortality rate by 0.36% which would be undetectable.

Table 12.32: Displacement matrix presenting the number of red-throated divers within the Array Area and 4 km buffer during spring migration that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	0	1	1	1	1	1	1	2
2	0	1	1	1	2	2	2	2	3	3
3	0	1	1	2	2	3	3	4	4	5
4	1	1	2	2	3	4	4	5	5	6
5	1	2	2	3	4	5	5	6	7	8
6	1	2	3	4	5	5	6	7	8	9
7	1	2	3	4	5	6	7	9	10	11
8	1	2	4	5	6	7	9	10	11	12
9	1	3	4	5	7	8	10	11	12	14
10	2	3	5	6	8	9	11	12	14	15
20	3	6	9	12	15	18	21	24	27	31
30	5	9	14	18	23	27	32	37	41	46
50	8	15	23	31	38	46	53	61	69	76
75	11	23	34	46	57	69	80	92	103	114
100	15	31	46	61	76	92	107	122	137	152

12.9.2.165 The impact of displacement and disturbance from offshore infrastructure on red-throated divers during spring migration is predicted to occur across the Array Area and 4 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Low.

SENSITIVITY OF RED-THROATED DIVERS

12.9.2.166 Red-throated divers are considered to have little tolerance for disturbance and displacement as they are notoriously shy and prone to avoiding disturbed areas (section 12.9.2.150).

12.9.2.167 Red-throated divers are considered to have a medium conservation value as some of those migrating through the Irish Sea during spring are likely to be connected to the Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA (10 km, 34 km and 99 km from the Array Area respectively) which are all designated for nonbreeding red-throated diver populations.

12.9.2.168 With respect to operational disturbance and displacement during spring migration, overall red-throated divers are considered to be of Medium sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING SPRING MIGRATION

12.9.2.169 Overall, for displacement and disturbance from offshore infrastructure during spring migration the magnitude has been assessed as **Low** and the sensitivity of receptor is considered to be **Medium**. The effect will, therefore, **Slight adverse**, which is **not significant** in EIA terms.

12.9.2.170 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.2.171 The estimated total number of red-throated divers subject to mortality combined across the mid-winter season, autumn migration and spring migration periods due to operational disturbance from the Array Area and 4 km buffer is between 4 and 39 individuals, although this total is likely to include an unknown degree of double counting of individuals present in more than one of these periods (Table 12.33).

12.9.2.172 At the average baseline mortality rate for red-throated divers of 0.228 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 4,167 (18,280 x 0.228). The addition of a maximum of 39 to this would increase the mortality rate by 0.94%, while the evidence-based estimate (4) would result in an increase in mortality of 0.08%. The biogeographic population for red-throated divers is 27,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 6,156 (27,000 x 0.228). The addition of 39 to this increases the mortality rate by 0.6%, while the evidence-based estimate (4) would result in an increase in mortality of 0.06%. These are all below the 1% threshold of detectability, therefore it is considered that operational displacement of red-throated diver summed across the entire nonbreeding period would have an undetectable effect on the population.

Table 12.33: Displacement matrix presenting the number of red-throated divers within the Array Area and 4 km buffer during all seasons that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	1	1	2	2	2	3	3	4	4
2	1	2	2	3	4	5	5	6	7	8
3	1	2	4	5	6	7	8	9	11	12
4	2	3	5	6	8	9	11	13	14	16
5	2	4	6	8	10	12	14	16	18	20
6	2	5	7	9	12	14	16	19	21	24
7	3	5	8	11	14	16	19	22	25	27
8	3	6	9	13	16	19	22	25	28	31
9	4	7	11	14	18	21	25	28	32	35
10	4	8	12	16	20	24	27	31	35	39
20	8	16	24	31	39	47	55	63	71	79
30	12	24	35	47	59	71	82	94	106	118
50	20	39	59	79	98	118	137	157	177	196
75	29	59	88	118	147	177	206	236	265	294
100	39	79	118	157	196	236	275	314	353	392

12.9.2.173 The impact of operational disturbance and associated vessel traffic on red-throated divers across all seasons is predicted to occur across the Array Area and 4km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF RED-THROATED DIVERS

12.9.2.174 Red-throated divers are considered to have little tolerance for disturbance and displacement as they are notoriously shy and prone to avoiding disturbed areas (section 12.9.2.150).

12.9.2.175 Red-throated divers are considered to have a medium conservation value as some of those migrating through the Irish Sea during spring and autumn and present in mid-winter may be connected to the Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA (10 km, 34 km and 99 km from the Array Area respectively) which are all designated for nonbreeding red-throated diver populations.

12.9.2.176 With respect to operational disturbance and displacement including all seasons, overall red-throated divers are considered to be of Medium sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.2.177 Overall, for operational disturbance and displacement across all seasons the magnitude has been assessed as **Negligible** to **Low** and the sensitivity of red-throated divers is considered

to be **Medium**. The effect will, therefore, be **Not Significant** to **Slight**, which is **not significant** in EIA terms.

12.9.2.178 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

GANNET

12.9.2.179 The assumption for gannet is that displacement will occur at a constant level to a distance of 2 km in line with guidance (JNCC *et al.* 2017), and that within this area, 80% of birds will be displaced and mortality of displaced birds will be 1%.

12.9.2.180 Empirical evidence shows that between 60% to 80% of gannets may be displaced from operational windfarms; a detailed study (Krijgsveld *et al.*, 2011) using radar and visual observations to monitor the post-construction effects of the OWEZ established that 64% of gannets avoided entering the windfarm (macro-avoidance). A similar result (80% macro avoidance) was also observed during a study at the Thanet windfarm (Skov *et al.*, 2018). Leopold *et al.*, (2013) reported that most gannets avoided Dutch offshore windfarms and did not forage within these. Dierschke *et al.*, (2016) concluded that gannets show high avoidance of offshore windfarms despite showing little avoidance of ships.

12.9.2.181 The most likely mortality rate for displaced gannets during nonbreeding seasons is assumed to be no more than 1% as they have the maximum score for habitat flexibility which means that they are able to use a wide range of habitats over a large area, and usually with a relatively wide range of foods (Furness and Wade, 2012).

12.9.2.182 It should be noted that the inclusion of birds within the 2 km buffer to determine the total number of birds subject to displacement is precautionary, since in reality the avoidance rate is likely to fall with distance from the Array Area, as demonstrated in a study of gannet distribution in relation to the Greater Gabbard windfarm (APEM, 2014).

12.9.2.183 The displacement matrices in Table 12.34 to Table 12.36 have been populated with data for gannets during the autumn migration, spring migration and breeding season within the Array Area and 2 km buffer. These tables present displacement rates between 10 and 100% at 10% increments, which have been combined with mortality between 1 and 100% at varying increments. Shading has been used to highlight the 60 to 80% displacement and 1% mortality ranges.

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.2.184 Using the seasonal peak breeding season abundance within the Array Area and 2 km buffer of 72 birds, the predicted number of individual gannets which could potentially be at risk of mortality as a consequence of displacement has been estimated to be one individual (Table 12.34).

Table 12.34: Displacement matrix presenting the number of gannets within the Array Area and 2 km buffer during the breeding season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	0	0	0	0	1	1	1	1
2	0	0	0	1	1	1	1	1	1	1
3	0	0	1	1	1	1	2	2	2	2
4	0	1	1	1	1	2	2	2	3	3
5	0	1	1	1	2	2	3	3	3	4
6	0	1	1	2	2	3	3	3	4	4
7	1	1	2	2	3	3	4	4	5	5
8	1	1	2	2	3	3	4	5	5	6
9	1	1	2	3	3	4	5	5	6	7
10	1	1	2	3	4	4	5	6	7	7
20	1	3	4	6	7	9	10	12	13	15
30	2	4	7	9	11	13	15	17	20	22
50	4	7	11	15	18	22	25	29	33	36
75	5	11	16	22	27	33	38	44	49	54
100	7	15	22	29	36	44	51	58	65	72

12.9.2.185 The breeding gannet population was estimated to be between 434,033 and 509,066 (Table 12.11). At the average baseline mortality rate for gannets of 0.191 (Table 12.14), the natural mortality for this population is between 82,900 (434,033 x 0.191) and 97,232 (509,066 x 0.191). The addition of a maximum of one individual to this would increase the mortality rate by 0.001% which would be undetectable.

12.9.2.186 The impact of displacement and disturbance from offshore infrastructure on gannets during the breeding season is predicted to occur across the Array Area and 4km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GANNETS

12.9.2.187 Although gannets are considered to show high macro-avoidance of windfarms (Krijgsveld *et al.*, 2011; Leopold *et al.*, 2013; Dierschke *et al.*, 2016; Skov *et al.*, 2018), which would suggest a high sensitivity score, this has been accounted for in the assessment in the application of a precautionary level of displacement (60 to 80%).

12.9.2.188 Gannets are considered to have a high conservation value as many of those present in the Irish Sea are likely to be connected to Irish SPA sites which contain gannet breeding colonies (Little Skellig, Bull Rock, Great Saltee, Ireland's Eye, Lambay Island) as well as UK SPA sites at Grassholm and Ailsa Craig.

12.9.2.189 With respect to operational disturbance and displacement during breeding season, overall gannets are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied

prey, medium recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the gannets present may be connected to SPA populations.

Significance of the effect during breeding season

12.9.2.190 Overall, for displacement and disturbance from offshore infrastructure during the breeding season the magnitude has been assessed as **Negligible** and the sensitivity of gannets is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.191 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING AUTUMN MIGRATION

12.9.2.192 Using the seasonal peak autumn migration abundance within the Array Area and 2 km buffer of 43 birds, the predicted number of individual gannets which could potentially be at risk of mortality as a consequence of displacement has been estimated to be 0 individuals (Table 12.35).

Table 12.35: Displacement matrix presenting the number of gannets within the Array Area and 2 km buffer during the autumn migration season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	1	1	1	1	1
3	0	0	0	1	1	1	1	1	1	1
4	0	0	1	1	1	1	1	1	2	2
5	0	0	1	1	1	1	2	2	2	2
6	0	1	1	1	1	2	2	2	2	3
7	0	1	1	1	2	2	2	2	3	3
8	0	1	1	1	2	2	2	3	3	3
9	0	1	1	2	2	2	3	3	3	4
10	0	1	1	2	2	3	3	3	4	4
20	1	2	3	3	4	5	6	7	8	9
30	1	3	4	5	6	8	9	10	12	13
50	2	4	6	9	11	13	15	17	19	22
75	3	6	10	13	16	19	23	26	29	32
100	4	9	13	17	22	26	30	34	39	43

12.9.2.193 As no individuals are expected to be at risk of mortality as a result of displacement during autumn migration, there would be no change to the background mortality of the population.

12.9.2.194 The impact of displacement and disturbance from offshore infrastructure on gannets during autumn migration is predicted to occur across the Array Area and 4 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GANNETS

12.9.2.195 Although gannets are considered to show high macro-avoidance of windfarms (Krijgsveld *et al.*, 2011; Leopold *et al.*, 2013; Dierschke *et al.*, 2016; Skov *et al.*, 2018), which would suggest a high sensitivity score, this has been accounted for in the assessment in the application of a precautionary level of displacement (60 to 80%).

12.9.2.196 Gannets are considered to have a high conservation value as many of those migrating through the Irish Sea are likely to be connected to Irish SPA sites which contain gannet breeding colonies (Little Skellig, Bull Rock, Great Saltee, Ireland's Eye, Lambay Island) as well as UK SPA sites at Grassholm and Ailsa Craig.

12.9.2.197 With respect to operational disturbance and displacement during autumn migration, overall gannets are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey, medium recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the gannets present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING AUTUMN MIGRATION

12.9.2.198 Overall, for displacement and disturbance from offshore infrastructure during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of gannets is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.199 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING SPRING MIGRATION

12.9.2.200 Using the seasonal peak spring migration abundance within the Array Area and 2 km buffer of 30 birds, the predicted number of individual gannets which could potentially be at risk of mortality as a consequence of displacement has been estimated to be 0 individuals (Table 12.36).

Table 12.36: Displacement matrix presenting the number of gannets within the Array Area and 2 km buffer during the spring migration season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	1	1
3	0	0	0	0	0	1	1	1	1	1
4	0	0	0	0	1	1	1	1	1	1
5	0	0	0	1	1	1	1	1	1	2
6	0	0	1	1	1	1	1	1	2	2
7	0	0	1	1	1	1	1	2	2	2
8	0	0	1	1	1	1	2	2	2	2
9	0	1	1	1	1	2	2	2	2	3
10	0	1	1	1	2	2	2	2	3	3
20	1	1	2	2	3	4	4	5	5	6
30	1	2	3	4	5	5	6	7	8	9
50	2	3	5	6	8	9	11	12	14	15
75	2	5	7	9	11	14	16	18	20	23
100	3	6	9	12	15	18	21	24	27	30

12.9.2.201 As no individuals are expected to be at risk of mortality as a result of displacement during spring migration, there would be no change to the background mortality of the population.

12.9.2.202 The impact of displacement and disturbance from offshore infrastructure on gannets during spring migration is predicted to occur across the Array Area and 4 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GANNETS

12.9.2.203 Although gannets are considered to show high macro-avoidance of windfarms (Krijgsveld *et al.*, 2011; Leopold *et al.*, 2013; Dierschke *et al.*, 2016; Skov *et al.*, 2018), which would suggest a high sensitivity score, this has been accounted for in the assessment in the application of a precautionary level of displacement (60 to 80%).

12.9.2.204 Gannets are considered to have a high conservation value as many of those migrating through the Irish Sea are likely to be connected to Irish SPA sites which contain gannet breeding colonies (Little Skellig, Bull Rock, Great Saltee, Ireland's Eye, Lambay Island) as well as UK SPA sites at Grassholm and Ailsa Craig.

12.9.2.205 With respect to operational disturbance and displacement during spring migration, overall gannets are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey, medium recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the gannets present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING SPRING MIGRATION

12.9.2.206 Overall, for displacement and disturbance from offshore infrastructure during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of gannets is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.207 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.2.208 Within the range of 60 to 80% displacement and 1% mortality, the maximum number of individual gannets which could potentially be at risk of mortality as a consequence of displacement from the Array Area and 2 km buffer during the breeding, autumn migration and spring migration periods combined has been estimated as one individual (Table 12.37).

Table 12.37: Displacement matrix presenting the number of gannets within the Array Area and 2 km buffer during all seasons that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	0	0	1	1	1	1	1	1	1
2	0	1	1	1	1	2	2	2	3	3
3	0	1	1	2	2	3	3	4	4	4
4	1	1	2	2	3	4	4	5	5	6
5	1	1	2	3	4	4	5	6	7	7
6	1	2	3	4	4	5	6	7	8	9
7	1	2	3	4	5	6	7	8	9	10
8	1	2	4	5	6	7	8	9	11	12
9	1	3	4	5	7	8	9	11	12	13
10	1	3	4	6	7	9	10	12	13	15
20	3	6	9	12	15	18	20	23	26	29
30	4	9	13	18	22	26	31	35	39	44
50	7	15	22	29	37	44	51	58	66	73
75	11	22	33	44	55	66	77	88	99	110
100	15	29	44	58	73	88	102	117	131	146

12.9.2.209 At the average baseline mortality rate for gannets of 0.191 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 123,119 (644,603 x 0.191). The addition of a maximum of one to this would increase the mortality rate by <0.001%. The biogeographic population for gannets is 1,180,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 225,380 (1,180,000 x 0.191). The addition of one to this increases the mortality rate <0.001%.

12.9.2.210 The impact of displacement and disturbance from offshore infrastructure on gannets during all seasons combined is predicted to occur across the Array Area and 4 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated

with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GANNETS

12.9.2.211 Although gannets are considered to show high macro-avoidance of windfarms (Krijgsveld *et al.*, 2011; Leopold *et al.*, 2013; Dierschke *et al.*, 2016; Skov *et al.*, 2018), which would suggest a high sensitivity score, this has been accounted for in the assessment in the application of a precautionary level of displacement (60 to 80%).

12.9.2.212 Gannets are considered to have a high conservation value as many of those in the Irish Sea are likely to be connected to Irish SPA sites which contain gannet breeding colonies (Little Skellig, Bull Rock, Great Saltee, Ireland's Eye, Lambay Island) as well as UK SPA sites at Grassholm and Ailsa Craig.

12.9.2.213 With respect to operational disturbance and displacement throughout the year, overall gannets are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey, medium recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the gannets present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.2.214 Overall, for displacement and disturbance from offshore infrastructure during all seasons combined the magnitude has been assessed as **Negligible** and the sensitivity of gannets is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.215 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

GUILLEMOTS AND RAZORBILLS

12.9.2.216 The assumption for guillemots and razorbills is that displacement will occur at a constant level to a distance of 2 km in line with guidance (JNCC *et al.* 2017) and that within this area (following NatureScot guidance) 60% will be displaced of which mortality would be between 3% and 5% in the breeding season and between 1% and 3% in the nonbreeding seasons.

12.9.2.217 Empirical evidence indicates that auk (guillemots and razorbills) displacement from windfarms is likely to be lower than 60%, although pre- and post-construction monitoring data have yielded variable results. Auks may be displaced to some extent by some windfarms, although displacement is partial and apparently negligible in some sites (Dierschke *et al.*, 2016). Several studies have reported displacement: guillemots were displaced at Blighbank (Vanermen *et al.*, 2012), were displaced only in a minority of surveys at two Dutch windfarms (OWEZ and Princess Amalia Windpark (PAWP); Leopold *et al.*, 2011; Krijgsveld *et al.*, 2011), and were not significantly displaced at Horns Rev (although the data suggest that slight displacement was probably occurring; Petersen *et al.*, 2006) or Thornton Bank (Vanermen *et al.*, 2012). However, while at least some of these studies have recorded changes in abundance and reported these as displacement, these results should be treated with caution due to limits on their power to distinguish natural inter-annual variation from windfarm effects, as noted in recent re-evaluation of some of these studies (Zuur 2018).

12.9.2.218 The maximum 5% mortality rate for auks is unconfirmed and this magnitude of impact is not supported in the literature. Given that this is half of the existing natural adult annual mortality for razorbill from all other sources of mortality combined (baseline mortality is 10.5%; Table 12.14) and approximately the same as that for guillemot (baseline mortality is 6% Table 12.14), it is highly improbable that such a large effect would occur. Mortality due to displacement might arise

if displacement increased competition for resources in the remaining areas of auk habitat outside the windfarm. However, it should be recognised that the mortality rate due to displacement may well be 0% since the increase in density of auks outside the windfarm area will be negligible (because the rest of the available habitat is vast), and is very unlikely to be as high as 5%.

12.9.2.219 MacArthur Green (2019b) undertook a review of available evidence for auk displacement and concluded that precautionary rates of displacement and mortality from operational windfarms would be 50% and 1% respectively. Thus, this assessment presents displacement in the range from 50% displaced and 1% mortality to 60% displaced and 3% (breeding season) and 5% (nonbreeding season) mortality, with a focus on the evidence-based rates of 50% displaced and 1% mortality.

12.9.2.220 The displacement matrices below have been populated with data for guillemots (Table 12.38 to Table 12.39) and razorbills (Table 12.40 to Table 12.43) during appropriate breeding and nonbreeding periods within the Array Area and 2 km buffer. These tables present displacement rates between 10% and 100% at 10% increments which have been combined with mortality between 1 and 100% at varying increments. Shading has been used to highlight the 50 to 60% displacement and 1 to 5% mortality ranges.

GUILLEMOT

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.2.221 Using the seasonal peak breeding season abundance within the Array Area and 2 km buffer of 9,010 birds, the predicted number of individual guillemots which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between 45 (at 50% displacement and 1% mortality) and 270 individuals (at 60% displacement and 5% mortality; (Table 12.38).

Table 12.38: Displacement matrix presenting the number of guillemots within the Array Area and 2 km buffer during the breeding season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	9	18	27	36	45	54	63	72	81	90
2	18	36	54	72	90	108	126	144	162	180
3	27	54	81	108	135	162	189	216	243	270
4	36	72	108	144	180	216	252	288	324	360
5	45	90	135	180	225	270	315	360	405	451
6	54	108	162	216	270	324	378	432	487	541
7	63	126	189	252	315	378	441	505	568	631
8	72	144	216	288	360	432	505	577	649	721
9	81	162	243	324	405	487	568	649	730	811
10	90	180	270	360	451	541	631	721	811	901
20	180	360	541	721	901	1081	1261	1442	1622	1802
30	270	541	811	1081	1352	1622	1892	2162	2433	2703
50	451	901	1352	1802	2253	2703	3154	3604	4055	4505
75	676	1352	2027	2703	3379	4055	4730	5406	6082	6758

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
100	901	1802	2703	3604	4505	5406	6307	7208	8109	9010

12.9.2.222 The BDMPS for guillemots during the breeding season was estimated at between 307,204 and 658,170 individuals (Table 12.11). At the average baseline mortality rate for guillemot of 0.140 (Table 12.14) the number of individuals expected to be at risk of mortality in the breeding season is between 43,008 and 92,144. The addition of 270 (at the worst-case precautionary displacement and mortality rates of 60% and 5%) would increase the mortality rate by 0.63%, while the addition of 45 (at the evidence based rates of 50% and 1%) the mortality rate would increase by 0.10%.

12.9.2.223 As the background mortality rate would not be increased by more than 1% (the threshold below which additional mortality is considered to have an undetectable effect), this magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.224 The impact of displacement and disturbance from offshore infrastructure on guillemots during the breeding season is predicted to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GUILLEMOTS

12.9.2.225 Guillemots are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.226 Guillemots are considered to have a high conservation value as many of those present in the Array Area and 2 km buffer during the breeding season are likely to be connected to the Ireland's Eye SPA and Lambay Island SPA (54 km and 62 km from the Array Area respectively) which are designated sites for breeding guillemot populations and are within mean maximum foraging range of the Proposed Development for this species.

12.9.2.227 With respect to operational disturbance and displacement during the breeding season, overall guillemots are considered to be of High sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, high recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the guillemots present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING BREEDING SEASON

12.9.2.228 Overall, displacement and disturbance from offshore infrastructure during the breeding season the magnitude has been assessed as **Negligible** and the sensitivity of guillemots is considered to be **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.229 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.2.230 Using the seasonal peak nonbreeding season abundance within the Array Area and 2 km buffer of 3,991 birds, the predicted number of individual guillemots which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between 20 (at 50% displacement and 1% mortality) and 72 individuals (at 60% displacement and 3% mortality; Table 12.39).

Table 12.39: Displacement matrix presenting the number of guillemots within the Array Area and 2 km buffer during the nonbreeding season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	4	8	12	16	20	24	28	32	36	40
2	8	16	24	32	40	48	56	64	72	80
3	12	24	36	48	60	72	84	96	108	120
4	16	32	48	64	80	96	112	128	144	160
5	20	40	60	80	100	120	140	160	180	200
6	24	48	72	96	120	144	168	192	216	239
7	28	56	84	112	140	168	196	223	251	279
8	32	64	96	128	160	192	223	255	287	319
9	36	72	108	144	180	216	251	287	323	359
10	40	80	120	160	200	239	279	319	359	399
20	80	160	239	319	399	479	559	639	718	798
30	120	239	359	479	599	718	838	958	1078	1197
50	200	399	599	798	998	1197	1397	1596	1796	1996
75	299	599	898	1197	1497	1796	2095	2395	2694	2993
100	399	798	1197	1596	1996	2395	2794	3193	3592	3991

12.9.2.231 The BDMPS for guillemots during the nonbreeding season was estimated at 1,316,309 individuals (Table 12.12). At the average baseline mortality rate for guillemot of 0.140 (Table 12.14), the number of individuals expected to be at risk of mortality in the nonbreeding season is 184,283 (1,316,309 x 0.14). The addition of up to 72 individuals to this would increase the mortality rate by 0.04%. As the background mortality rate would not be increased by more than 1% (the threshold below which additional mortality is considered to have an undetectable effect), this magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.232 The impact of displacement and disturbance from offshore infrastructure on guillemots during the nonbreeding season is predicted to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GUILLEMOTS

12.9.2.233 Guillemots are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.234 With respect to operational disturbance and displacement during the nonbreeding season, overall guillemots are considered to be of Medium sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING NONBREEDING SEASON

12.9.2.235 Overall, for displacement and disturbance from offshore infrastructure during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of guillemots is considered to be **Medium.** The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.236 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.2.237 The estimated number of guillemots subject to mortality combined across both the breeding and nonbreeding seasons due to displacement from the Array Area and 2 km buffer is between 65 (20 in the breeding season plus 45 in the nonbreeding season, at 50% displaced and 1% mortality) and 342 (270 at 60% displaced and 5% mortality in the breeding season plus 72 at 60% displaced and 3% mortality in the nonbreeding season, summed across the seasons.

12.9.2.238 At the average baseline mortality rate for guillemot of 0.140 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 184,283 (1,316,309 x 0.14). The addition of up to 342 to this increases the mortality rate by 0.18%. The biogeographic population for guillemots is 4,125,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 577,500 (4,125,000 x 0.140). The addition of 342 to this increases the mortality rate by 0.06%. Thus, the increase in background mortality is between 0.06% and 0.18%. This magnitude of increase in mortality is below the 1% threshold of detectability and would not materially alter the background mortality of the population and would be undetectable.

12.9.2.239 The impact of displacement and disturbance from offshore infrastructure on guillemots across all seasons is predicted to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF GUILLEMOTS

12.9.2.240 Guillemots are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern

index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.241 With respect to operational disturbance and displacement, overall guillemots are considered to be of High sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, high recovery following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.2.242 Overall, for displacement and disturbance from offshore infrastructure during all seasons combined (including the breeding and nonbreeding seasons) the magnitude has been assessed as **Negligible** and the sensitivity of guillemots is considered to be **Medium.** The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.243 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

RAZORBILL

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.2.244 Using the seasonal peak breeding season abundance within the Array Area and 2 km buffer of 488 birds, the predicted number of individual razorbills which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between 2 (at 50% displacement and 1% mortality) and 15 individuals (at 60% displacement and 5% mortality; Table 12.40).

Table 12.40: Displacement matrix presenting the number of razorbills within the Array Area and 2 km buffer during the breeding season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	0	1	1	2	2	3	3	4	4	5
2	1	2	3	4	5	6	7	8	9	10
3	1	3	4	6	7	9	10	12	13	15
4	2	4	6	8	10	12	14	16	18	20
5	2	5	7	10	12	15	17	20	22	24
6	3	6	9	12	15	18	20	23	26	29
7	3	7	10	14	17	20	24	27	31	34
8	4	8	12	16	20	23	27	31	35	39
9	4	9	13	18	22	26	31	35	40	44
10	5	10	15	20	24	29	34	39	44	49
20	10	20	29	39	49	59	68	78	88	98
30	15	29	44	59	73	88	102	117	132	146
50	24	49	73	98	122	146	171	195	220	244
75	37	73	110	146	183	220	256	293	329	366
100	49	98	146	195	244	293	342	390	439	488

12.9.2.245 The BDMPS for razorbills during the breeding season was estimated at between 41,886 and 313,861 individuals (Table 12.11). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is between 7,288 and 54,611. The addition of a maximum of 15 individuals to this would increase the mortality rate between 0.027% and 0.20%. As the background mortality rate would not be increased by more than 1% (the threshold below which additional mortality is considered to have an undetectable effect), this magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.246 The impact of displacement and disturbance from offshore infrastructure on razorbills during the breeding season is predicted to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.247 Razorbills are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.248 Razorbills are considered to have a high conservation value due to potential connectivity between the Array Area and Ireland's east coast SPA sites (e.g. Ireland's Eye, Lambay Island and Saltee Islands SPAs).

12.9.2.249 With respect to operational disturbance and displacement during the breeding season, overall razorbills are considered to be of High sensitivity. This is due to a combination of a low tolerance and low adaptability of offshore windfarms, but high recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the razorbills present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING BREEDING SEASON

12.9.2.250 Overall, for displacement and disturbance from offshore infrastructure during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of razorbills is considered to be **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.251 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING AUTUMN MIGRATION

12.9.2.252 Using the seasonal peak autumn migration abundance within the Array Area and 2 km buffer of 2,570 birds, the predicted number of individual razorbills which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between 13 (at 50% displaced and 1% mortality) and 46 individuals (at 60% displaced and 3% mortality; Table 12.41).

Table 12.41: Displacement matrix presenting the number of razorbills within the Array Area and 2 km buffer during autumn migration that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	3	5	8	10	13	15	18	21	23	26
2	5	10	15	21	26	31	36	41	46	51
3	8	15	23	31	39	46	54	62	69	77
4	10	21	31	41	51	62	72	82	93	103
5	13	26	39	51	64	77	90	103	116	129
6	15	31	46	62	77	93	108	123	139	154
7	18	36	54	72	90	108	126	144	162	180
8	21	41	62	82	103	123	144	164	185	206
9	23	46	69	93	116	139	162	185	208	231
10	26	51	77	103	129	154	180	206	231	257
20	51	103	154	206	257	308	360	411	463	514
30	77	154	231	308	386	463	540	617	694	771
50	129	257	386	514	643	771	900	1028	1157	1285
75	193	386	578	771	964	1157	1349	1542	1735	1928
100	257	514	771	1028	1285	1542	1799	2056	2313	2570

12.9.2.253 The BDMPS for razorbills during autumn migration was estimated at 630,411 individuals (Table 12.12). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals expected to be at risk of mortality during autumn migration is 109,692. The addition of up to 46 individuals to this would increase the mortality rate by 0.04%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.254 The impact of displacement and disturbance from offshore infrastructure on razorbills during autumn migration is predicted to occur across the Array Area and 2km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.255 Razorbills are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.256 Razorbills are considered to have a medium conservation value due to potential connectivity between the Array Area and Ireland's east coast SPA sites (e.g. Ireland's Eye, Lambay Island and Saltee Islands SPAs).

12.9.2.257 With respect to operational disturbance and displacement during the autumn migration, overall razorbills are considered to be of Medium sensitivity. This is due to a combination of a low

tolerance of offshore windfarms but medium adaptability, medium recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING AUTUMN MIGRATION

12.9.2.258 Overall, for displacement and disturbance from offshore infrastructure during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of razorbills is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.259 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

WINTER SEASON

MAGNITUDE OF IMPACT DURING THE WINTER SEASON

12.9.2.260 Using the seasonal peak winter season abundance within the Array Area and 2 km buffer of 2,558 birds, the predicted number of individual razorbills which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between 13 (at 50% displaced and 1% mortality) and 46 individuals (at 60% displaced and 3% mortality; Table 12.42).

Table 12.42: Displacement matrix presenting the number of razorbills within the Array Area and 2 km buffer during the winter season that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	3	5	8	10	13	15	18	20	23	26
2	5	10	15	20	26	31	36	41	46	51
3	8	15	23	31	38	46	54	61	69	77
4	10	20	31	41	51	61	72	82	92	102
5	13	26	38	51	64	77	90	102	115	128
6	15	31	46	61	77	92	107	123	138	153
7	18	36	54	72	90	107	125	143	161	179
8	20	41	61	82	102	123	143	164	184	205
9	23	46	69	92	115	138	161	184	207	230
10	26	51	77	102	128	153	179	205	230	256
20	51	102	153	205	256	307	358	409	460	512
30	77	153	230	307	384	460	537	614	691	767
50	128	256	384	512	640	767	895	1023	1151	1279
75	192	384	576	767	959	1151	1343	1535	1727	1919
100	256	512	767	1023	1279	1535	1791	2046	2302	2558

12.9.2.261 The BDMPS for razorbills during winter was estimated at 364,919 individuals (Table 12.12). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14) the number of individuals expected to be at risk of mortality during the winter season is 63,496 (364,919 x 0.174). The addition of up to 46 individuals to these would increase the mortality rate by 0.07%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.262 The impact of displacement and disturbance from offshore infrastructure on razorbills during the winter season is to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.263 Razorbills are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.264 Razorbills are considered to have a medium conservation value due to potential connectivity between the Array Area and Ireland's east coast SPA sites (e.g. Ireland's Eye, Lambay Island and Saltee Islands SPAs).

12.9.2.265 With respect to operational disturbance and displacement during mid-winter, overall razorbills are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but medium adaptability, medium recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE WINTER SEASON

12.9.2.266 Overall, for displacement and disturbance from offshore infrastructure during mid-winter the magnitude has been assessed as **Negligible** and the sensitivity of razorbills is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.267 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING SPRING MIGRATION

12.9.2.268 Using the seasonal peak spring migration abundance within the Array Area and 2 km buffer of 3,711 birds, the predicted number of individual razorbills which could potentially be at risk of mortality as a consequence of displacement has been estimated to be between 17 (at 50% displaced and 1% mortality) and 60 individuals (at 60% displaced and 3% mortality; Table 12.43).

Table 12.43: Displacement matrix presenting the number of razorbills within the Array Area and 2 km buffer during spring migration that may be subject to mortality (shaded)

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	3	7	10	13	17	20	23	27	30	33
2	7	13	20	27	33	40	47	53	60	67
3	10	20	30	40	50	60	70	80	90	100
4	13	27	40	53	67	80	94	107	120	134
5	17	33	50	67	84	100	117	134	150	167
6	20	40	60	80	100	120	140	160	180	200
7	23	47	70	94	117	140	164	187	210	234
8	27	53	80	107	134	160	187	214	241	267
9	30	60	90	120	150	180	210	241	271	301
10	33	67	100	134	167	200	234	267	301	334
20	67	134	200	267	334	401	468	535	601	668
30	100	200	301	401	501	601	702	802	902	1002
50	167	334	501	668	835	1002	1169	1336	1503	1671
75	251	501	752	1002	1253	1503	1754	2005	2255	2506
100	334	668	1002	1336	1671	2005	2339	2673	3007	3341

12.9.2.269 The BDMPS for razorbills during the spring migration was estimated at 630,411 individuals (Table 12.12). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals expected to be at risk of mortality during spring migration is 109,642 (630,411 x 0.174). The addition of up to 60 individuals to this would increase the mortality rate by 0.05%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.270 The impact of displacement and disturbance from offshore infrastructure on razorbills during spring migration is predicted to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.271 Razorbills are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.272 Razorbills are considered to have a medium conservation value due to potential connectivity between the Array Area and Ireland's east coast SPA sites (e.g. Ireland's Eye, Lambay Island and Saltee Islands SPAs).

12.9.2.273 With respect to operational disturbance and displacement during spring migration, overall razorbills are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but medium adaptability, medium recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING SPRING MIGRATION

12.9.2.274 Overall, for displacement and disturbance from offshore infrastructure during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of razorbills is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.275 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.2.276 The estimated number of razorbills subject to mortality combined across the breeding season, winter season, autumn and spring migration periods due to displacement from the Array Area and 2 km buffer is between 45 (2 in the breeding season, 13 in the autumn, 13 in the winter and 17 in the spring, at 50% displaced and 1% mortality) and 167 individuals (15 in the breeding season at 60% displaced and 5% mortality plus 46 in the autumn, 46 in the winter and 60 in the spring at 60% displaced and 3% mortality in the nonbreeding seasons).

12.9.2.277 At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 109,692 (630,411 x 0.174). The addition of up to 167 to this increases the mortality rate by 0.15%. The biogeographic population for razorbills is 1,707,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 297,018 (1,707,000 x 0.174). The addition of up to 167 to this increases the mortality rate by 0.05%. Thus, the increase in background mortality is between 0.05% and 0.15%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.2.278 The impact of displacement and disturbance from offshore infrastructure on razorbills during all seasons is predicted to occur across the Array Area and 2 km buffer and, assuming this species does not habituate to the presence of WTGs, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF RAZORBILLS

12.9.2.279 Razorbills are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.9.2.280 Razorbills are considered to have a medium conservation value due to potential connectivity between the Array Area and Ireland's east coast SPA sites (e.g. Ireland's Eye, Lambay Island and Saltee Islands SPAs).

12.9.2.281 With respect to operational disturbance and displacement throughout the year, overall razorbills are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but medium adaptability, medium recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.2.282 Overall, for displacement and disturbance from offshore infrastructure during all seasons combined the magnitude has been assessed as **Negligible** and the sensitivity of razorbills is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.283 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Decommissioning phase

12.9.2.284 The Rehabilitation Schedule sets out the process for decommissioning. This proposes decommissioning which is largely a reversal of construction and will take place over a period of up to two years.

12.9.2.285 During the decommissioning phase, direct disturbance and displacement of red-throated divers, gannet, guillemots and razorbills is likely to occur due to the presence of working vessels and crews and the movement and noise associated with these within the Array Area.

MAGNITUDE OF IMPACT

12.9.2.286 Such activities have already been assessed in the construction section above and have been found to be of Low or Negligible magnitude.

12.9.2.287 As for the construction phase, the impact of displacement and disturbance is predicted to be of local spatial extent, short term duration, continuous and high reversibility. It is predicted that the impact will affect seabirds directly. The magnitude is therefore, considered to be Negligible.

SENSITIVITY OF SEABIRDS

12.9.2.288 As for the construction phase, razorbills, guillemots and red-throated divers are deemed to be of medium to high vulnerability, medium to high recoverability and high value. The sensitivity of the receptors is therefore, considered to be Medium to High.

SIGNIFICANCE OF THE EFFECT

12.9.2.289 The magnitude of the impact has been assessed as **Negligible** and the sensitivity of seabird species is considered to range between **Medium** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.2.290 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

12.9.3 Impact 1 – Project Design Option 1b Direct disturbance and displacement

12.9.3.1 The extent of the Array Area and the construction programme are identical for Design Options 1a and 1b, therefore Impact 1 is also identical for all receptors, as detailed in section 12.9.2.

12.9.4 Impact 1 – Project Design Option 2 Direct disturbance and displacement

12.9.4.1 The extent of the Array Area and the construction programme for Project Design Option 2 is identical to that for Project Design Option 1a and 1b, therefore Impact 1 is also identical for all receptors, as detailed in section 12.9.2.

12.9.5 Impact 2 – Project Design Option 1 (WTG model 1a) Indirect disturbance and displacement resulting from changes to prey species and habitats

Construction phase

12.9.5.1 Birds may be indirectly disturbed and displaced during the construction phase if there are direct impacts on prey species and the habitats of prey species. An impact that reduces prey availability within the Array Area or along the Cable Corridor and Working Area could potentially result in indirectly displacing birds by changing foraging movements and other behavioural activities; this in turn could result in a loss of fitness and a reduction in survival chances of some seabird species.

12.9.5.2 During construction, the production of underwater noise (e.g. during piling) and the generation of suspended sediments (e.g. during sand wave clearance activities) may disturb and displace prey benthic invertebrates and fish species by altering their behaviour or availability. Underwater noise may cause fish and mobile invertebrates to avoid the construction area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey and potentially reduce visibility of prey in the water column for visual predators. These mechanisms could result in less prey being available within the construction area to foraging seabirds.

12.9.5.3 Such potential effects on benthic habitats and fish are assessed in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026). The main fish prey species considered in this EIAR to be important to seabirds include herring, sprat and sandeel (refer to Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)).

12.9.5.4 The conclusions of the assessments presented in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) inform this assessment of indirect effects on ornithological receptors.

MAGNITUDE OF IMPACT

12.9.5.5 With regard to the influence of underwater noise on fish prey species important for seabirds, the assessment in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) concluded that underwater noise would not cause physical injury or behavioural changes to fish and therefore, noise was considered to have minor or negligible effect on disturbance and displacement of these fish species. It is concluded that a minor or negligible adverse direct impact on fish prey species will have an undetectable indirect impact on seabird species.

12.9.5.6 With regard to changes increases in suspended sediment levels and associated deposition, the assessment in Volume II, Chapter 6: Coastal Processes (Revised March 2026) concluded that the magnitude of the impact would be of local spatial extent, short term duration, intermittent and of high reversibility. The consequent indirect impact on benthic ecology and the main prey fish species important for seabirds through habitat loss was considered to be of low magnitude and of slight adverse significance, which is not significant in EIA terms (see Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)). It is concluded that a slight or imperceptible adverse direct impact on fish prey species will have an undetectable indirect impact on seabird species.

12.9.5.7 The impact of indirect effects of displacement and disturbance caused by construction activities and associated vessel traffic on seabirds is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population,

therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF SEABIRDS

12.9.5.8 The vulnerability of seabirds to indirect impacts of disturbance and displacement will vary depending on their habitat requirements. Seabirds with highly specialised habitat requirements that are limited in availability are likely to be more vulnerable to indirect impacts of disturbance and displacement on prey species, whereas seabirds that have large areas of alternative habitat available are expected be less vulnerable (Furness *et al.*, 2013; Bradbury *et al.*, 2014).

12.9.5.9 Due to the proximity of the Array Area to land, some breeding seabird species (i.e. guillemot, gannet and kittiwake) are considered to have a high conservation value (Table 12.10) due to their connectivity with Irish SPA sites designated for breeding birds that are within foraging range of the Array Area (e.g. Wicklow Head, Howth Head Coast, Ireland's Eye, Lambay Island and Saltee Islands). Red-throated divers are also considered to have a high conservation value as they may pass through the Array Area on their way to their nonbreeding designated sites at Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA.

12.9.5.10 With respect to indirect construction disturbance, overall seabirds are considered to be of low to high sensitivity. This is due to combinations of low to high adaptability and low to high tolerance, predicted rapid recoverability following cessation of the effect and medium to high conservation value since, as noted above, a proportion of the seabirds present in the Array Area may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.9.5.11 Overall, for the indirect construction disturbance the magnitude of the impact has been assessed as **Negligible** and the sensitivity of seabird species is considered to range between **Low** to **High.** The effect will, therefore, be **Not Significant** in EIA terms.

12.9.5.12 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

Operational and maintenance phase

12.9.5.13 Birds may be indirectly disturbed and displaced during the operational and maintenance phase if there are direct impacts on prey species and the habitats of prey species within the Array Area or along the Cable Corridor and Working Area.

12.9.5.14 During operation, the production of underwater noise (e.g. through the turning of the wind turbines), loss of habitat, electro-magnetic fields (EMF) and the generation of suspended sediments (e.g. due to scour or maintenance activities) may alter the behaviour or availability of bird prey species. Underwater noise and EMF may cause fish and mobile invertebrates to avoid the operational area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the operational area and may smother and hide immobile benthic prey. These mechanisms could result in less prey being available within the operational area to foraging seabirds. Changes in fish and invertebrate communities due to the presence of hard substrate (resulting in colonisation by epifauna and provision of novel habitat providing shelter for fish and invertebrates) may also occur, and changes in fishing activity could influence the communities present.

12.9.5.15 Such potential effects on benthic invertebrates and fish have been assessed in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026). The main fish prey species considered in this EIAR to be important to seabirds include herring, sprat and sandeel (refer to Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)).

12.9.5.16 The conclusions of the assessments in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) inform this assessment of indirect effects on ornithological receptors.

MAGNITUDE OF IMPACT

12.9.5.17 With regard to the influence of underwater noise on fish and shellfish prey species important for seabirds, the assessment in Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) concluded that the sensitivity of fish and shellfish to operational noise is considered to be low and the magnitude of effect negligible. It is concluded that a minor or negligible adverse direct impact on fish prey species will have an undetectable indirect impact on seabird species within the Array Area or along the Cable Corridor and Working Area.

12.9.5.18 With regard to changes to the seabed and to suspended sediment levels, the assessment in Volume II, Chapter 6: Coastal Processes (Revised March 2026) concluded that the small quantities of sediment released due to scour processes or cable maintenance activities would rapidly settle within a few hundred metres of each wind turbine/cable protection structure or cable repair/reburial site. The consequent indirect impact on benthic ecology and the main prey fish species important for seabirds through smothering due to increased suspended sediment during operation was considered to be of low or negligible magnitude and of slight or imperceptible adverse significance, which is not significant in EIA terms (see Volume II, Chapters 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)). It is concluded that a slight or imperceptible adverse direct impact on fish prey species will have an undetectable indirect impact on seabird species.

12.9.5.19 With regard to EMF effects, these are identified as highly localised, with the majority of cables being buried to a minimum of 1 m depth, further reducing the effect of EMF (see Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)).

12.9.5.20 Potential changes in benthic communities due to colonisation of hard substrate within the Array Area and along the Cable Corridor and Working Area is assessed in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026). Whilst the impact of the colonisation of introduced hard substrate is assessed to be of slight adverse significance in terms of benthic ecology (as it is a change from the baseline conditions), the consequences for seabirds may be positive or negative locally but are unlikely to be significant at a wider scale. Dierschke *et al.*, (2016) concluded that cormorants (both cormorant and shag) tend to be attracted to offshore windfarms because the structures provide an opportunity for cormorants to roost and to dry their wings so extend their potential foraging habitat further offshore. Several gull species and red-breasted mergansers were found to tend to increase in abundance at offshore windfarms, which Dierschke *et al.*, (2016) interpreted as most likely to be responses to increased foraging opportunities resulting from higher abundance of fish and invertebrates associated with offshore windfarm structures and possibly the reduction in fishing activity.

12.9.5.21 Overall, the impact of displacement and disturbance is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect seabirds indirectly. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF SEABIRDS

12.9.5.22 As for during construction, seabirds are deemed to be of low to high vulnerability, medium to high recoverability and medium to high value. The sensitivity of the receptor is therefore, considered to be Low to High.

SIGNIFICANCE OF THE EFFECT

12.9.5.23 Overall, the magnitude of the impact has been assessed as **Negligible** and the sensitivity of seabird species is considered to range between **Low** to **High**. The effect will, therefore be **Not Significant** in EIA terms.

12.9.5.24 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

Decommissioning phase

12.9.5.25 The Rehabilitation Schedule sets out the process for decommissioning. This proposes decommissioning which is largely a reversal of construction and will take place over a period of up to two years.

12.9.5.26 During the decommissioning phase, indirect effects such as displacement of seabird prey species are likely to occur as structures are removed from the Array Area.

MAGNITUDE OF IMPACT

12.9.5.27 Any effects on seabirds resulting from disturbance and displacement to prey fish and shellfish species caused by underwater noise, changes to the seabed and suspended sediment levels are expected to be similar, or of reduced magnitude, to those generated during the construction phase.

12.9.5.28 As for the construction phase, the impact of displacement and disturbance is predicted to be of local spatial extent, short term duration, continuous and high reversibility. It is predicted that the impact will affect seabirds indirectly. The magnitude is therefore, considered to be Negligible.

SENSITIVITY OF SEABIRDS

12.9.5.29 As for the construction phase, seabirds are deemed to be of low to high vulnerability, medium to high recoverability and medium to high value. The sensitivity of the receptor is therefore, considered to be Low to High.

SIGNIFICANCE OF THE EFFECT

12.9.5.30 The magnitude of the impact has been assessed as **Negligible** and the sensitivity of seabird species is considered to range between **Low** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.5.31 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

12.9.6 Impact 2 – Project Design Option 1 (WTG model 1b) Indirect disturbance and displacement resulting from changes to prey species and habitats

12.9.6.1 All impacts for Impact 2 – Indirect disturbance and displacement resulting from changes to prey species and habitats for Project Design Option 1b are identical with Project Design Option 1a as the Array Area is not affected by the different Design Options (section 12.9.5).

12.9.7 Impact 2 – Project Design Option 2 Indirect disturbance and displacement resulting from changes to prey species and habitats

12.9.7.1 All impacts for Impact 2 – Indirect disturbance and displacement resulting from changes to prey species and habitats for Project Design Option 2 are identical with Project Design Option 1a as the Array Area is not affected by the different Design Options in section 12.9.5.

12.9.8 Impact 3 – Project Design Option 1 (WTG model 1a) Collision risk

Operational and maintenance phase

12.9.8.1 There is a potential risk of collision with the wind turbine rotors and associated infrastructure resulting in injury or fatality to birds which fly through the Array Area whilst foraging for food or commuting between breeding sites and foraging areas.

12.9.8.2 Initial screening for species to include in the collision risk assessment is presented Table 12.44. Species were screened in following consideration of their predicted susceptibility to collisions and their abundance in flight (estimated from the baseline aerial surveys).

Table 12.44: Collision risk screening

Receptor	Risk of collisions (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.*, 2016)	Estimated density of birds in flight within the Array Area	Screening Result (IN or OUT)
Arctic skua	Medium	None	OUT
Arctic tern	Low	Medium	IN
Black headed gull	Medium	Medium	IN
Common gull	Medium	Medium	IN
Common scoter	Very low	Low	OUT
Common tern	Low	Low	IN
Cormorant	N/A	Very low	OUT
Fulmar	Low	Low	IN
Gannet	Medium	Low	IN
Great black-backed gull	High	Low	IN
Great northern diver	Low	Very low	OUT
Guillemot	Very low	High	OUT
Herring gull	High	Low	IN
Kittiwake	Medium	High	IN
Lesser black-backed gull	High	Low	IN
Little gull	Medium	Medium	IN
Manx shearwater	Very low	Medium	OUT
Puffin	Very low	Low	OUT
Razorbill	Very low	Medium	OUT

Receptor	Risk of collisions (Garthe and Hüppop, 2004; Furness and Wade, 2012, Wade *et al.,* 2016)	Estimated density of birds in flight within the Array Area	Screening Result (IN or OUT)
Red-throated diver	Low	Low	OUT
Sandwich tern	Low	Low	IN
Shag	Very low	Low	OUT

12.9.8.3 Collision Risk Modelling (CRM) has been used to estimate the collision risk mortality to birds recorded within the Array Area using Option 2 of the Band model (Band, 2012) run as a stochastic simulation using sCRM (Caneco and Humphries 2022). Option 2 uses generic estimates of flight height for each species (Johnston *et al*., 2014 a,b) to estimate the Proportion of birds at Collision Height (PCH). In addition, Option 1, using site-specific flight height data, has also been used for kittiwake. Flight height data collected at three wind farm sites (ABWP2, Dublin Array and Codling) were available to estimate flight height. A weighted average was considered the most robust method for combining these datasets (see Volume III, Appendix 12.4: Offshore Ornithology Technical Report: Collision Risk Modelling Parameters (Revised March 2026) for details). The weighted average PCH for kittiwake for use with Option 1 was 0.72%.

12.9.8.4 The approach to CRM is summarised here and further details are provided in Volume III, Appendix 12.1: Offshore Ornithology Technical Report Overview (Revised March 2026), Volume III, Appendix 12.4: Offshore Ornithology: Seabird Collision Risk Modelling Input Parameters (Revised March 2026) and Volume III, Appendix 12.5: Offshore Ornithology: Seabird Collision Risk Modelling Results (Revised March 2026).

12.9.8.5 The stochastic CRM is a simulation model designed to run multiple times (e.g. n = 1,000) using randomly generated values for key input parameters on each iteration, thereby generating n estimates of collision risk, explicitly accounting for parameter uncertainty, from which the mean and standard deviation (or 95% confidence intervals) can be obtained.

12.9.8.6 The model was run with a monthly time step (i.e. collision estimates are estimated for each month), incorporating variation in seabird density and collision avoidance rate for all species, and variation in body length, wingspan, flight speed and nocturnal activity factor (NAF) for those species where variance estimates are available (see Volume III, Appendix 12.1: Offshore Ornithology Technical Report Overview (Revised March 2026) for details).

12.9.8.7 For each species, 1,000 estimates the mean monthly Collision risks were calculated with input parameter values using the monthly density values (mean and standard deviations). Parameter values used for each species were those advised by Natural England (Table 12.45); and proportions at collision height were those in the generic dataset in Johnston *et al.* (2014a, 2014b), with the addition of site-specific flight heights for kittiwake.

12.9.8.8 The input parameters for the collision modelling are provided in Volume III, Appendix 12.4: Offshore Ornithology Technical Report - Seabird Collision Risk Model Input Parameters (Revised March 2026) (Revised March 2026) and the outputs are presented in full in Volume III, Appendix 12.5: Offshore Ornithology Technical Report - Seabird Collision Modelling Results (Revised March 2026) (Revised March 2026).

12.9.8.9 It should be noted that estimation of seabird avoidance rates at offshore windfarms is an area of ongoing research. For example, a study on gannet behaviour in relation to offshore windfarms (APEM, 2014) gathered evidence which suggests this species may exhibit a higher avoidance rate than the current recommended rate of 98.9%. This work, conducted during the autumn migration period, indicated an overall wind turbine avoidance rate of 100%, although a

precautionary rate of 99.5% was proposed (for the autumn period at least). Over the last few years avoidance rates for almost all species have gradually risen as the evidence for very high levels of avoidance has accumulated. Most recently Ozsanlav-Harris *et al.* (2023) conducted a review on behalf of JNCC which recommended that collision avoidance rates for all species for which data could be obtained should be higher than the current UK SNCB advice. These higher rates have resulted in SNCB advice to increase avoidance for some species, although notably not as high as the values recommended by Ozsanlav-Harris *et al.* (2023). Thus, the collision modelling presented here, which has followed UK SNCB guidance, remains precautionary compared with the most recent available evidence on seabird collisions.

12.9.8.10 Similar work has highlighted that levels of nocturnal activity in most seabirds are considerably lower than had previously been assumed, and adjustments for this would also reduce predicted collision rates (but are not currently advised by UK SNCBs). This further highlights the precaution inherent in the assessment.

12.9.8.11 Seasonal mortality predictions have been assessed in relation to the relevant BDMPS populations (Table 12.11, Table 12.12) and the predicted increases in background mortality have been estimated. The following sections provide a summary of the outputs of the assessment, using the seasons defined in Table 12.8. Seasonal and annual collision risk estimates for all species assessed are presented in (Table 12.46).

Table 12.45: Parameter values used in the stochastic CRM

Receptor	Parameter values used				
	Avoidance rate (%; SD)	Nocturnal activity rate (%; SD)	Flight speed (m/s; SD)	Body length (m; SD)	Wingspan (m; SD)
Arctic tern	99.1 (0.04)	0	10.5 (0)	0.33 (0)	0.87 (0)
Black headed gull	99.5 (0.02)	25 (0)	11.9 (0)	0.37 (0)	1.1 (0)
Common gull	99.5 (0.02)	25 (0)	13.4 (0)	0.42 (0)	1.3 (0)
Common tern	99.1 (0.04)	0	10.5 (0)	0.33 (0)	0.87 (0)
Fulmar	99.1 (0.04)	75 (0)	13 (0)	0.48 (0)	1.07 (0)
Gannet*	99.79 (0.03)	8 (10)	14.9 (0)	0.94 (0.0325)	1.72 (0.0375)
Great Black-backed gull	99.4 (0.04)	37.5 (6.375)	13.7 (1.2)	0.71 (0.035)	1.58 (0.0375)
Herring gull	99.4 (0.04)	37.5 (6.375)	12.8 (1.8)	0.6 (0.0225)	1.44 (0.03)
Kittiwake	99.3 (0.03)	37.5 (6.375)	8.71 (0.4)	0.39 (0.05)	1.08 (0.0625)

Receptor	Parameter values used				
	Avoidance rate (%; SD)	Nocturnal activity rate (%; SD)	Flight speed (m/s; SD)	Body length (m; SD)	Wingspan (m; SD)
Lesser Black-backed gull	99.4 (0.04)	37.5 (6.375)	13.1 (1.9)	0.58 (0.03)	1.42 (0.0375)
Little gull	99.5 (0.02)	25 (0)	12.2 (0)	0.26 (0)	0.78 (0)
Sandwich tern	99.1 (0.04)	0	10.3 (3.4)	0.39 (0.005)	1.0 (0.04)

** the gannet avoidance rate incorporates overall windfarm avoidance ('macro') at a rate of 75% as per current Natural England advice.*

12.9.8.12 The seasonal and annual collision risk estimates for Project Design Option 1a are presented in Table 12.46. Several species had very low predicted annual collision risks (Table 12.46). These were fulmar (Design 1a: 0), great black-backed gull (Design 1a: 0.7), gannet (Design 1a: 1.3), lesser black-backed gull (Design 1a: 0.8) and Sandwich tern (Design 1a: 0.14). As the magnitudes of predicted impact for these species were so small, no further assessment is considered necessary for these species.

12.9.8.13 The species with more than 1.5 predicted collisions per year for which assessment has been undertaken are Arctic tern, black-headed gull, common gull, common tern, herring gull, kittiwake and little gull.

Table 12.46: Seasonal Collision Risk Estimates for Project Design Option 1a. Values are the Mean Number of Predicted Collisions and 95% Confidence Intervals Derived From upper and lower confidence intervals of seabird densities

Species	Breeding season	Autumn migration	Winter	Spring Migration	Nonbreeding	Annual
Arctic tern	1.4 (0.3-2.5)	0 (0-0.1)	0 (0-0.1)	0.3 (0-0.6)	0.4 (0-0.8)	1.8 (0.3-3.3)
Black-headed gull	0.1 (0-0.2)	0 (0-0)	0 (0-0)	0 (0-0)	17 (2.2-34.7)	17.1 (2.2-34.9)
Common gull	0.9 (0-2)	0 (0-0)	0 (0-0)	0 (0-0)	62.8 (9.8-124)	63.7 (9.9-126)
Common tern	2.5 (0.7-4.6)	0.3 (0.1-0.6)	0 (0-0)	0.3 (0.1-0.6)	0 (0-0)	3.2 (0.9-5.8)
Fulmar	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Gannet	0.8 (0.1-2)	0.3 (0-0.6)	0.1 (0-0.2)	0.1 (0-0.3)	0.5 (0-1.1)	1.3 (0.1-3.1)
Great black-backed gull	0 (0-0)	0 (0-0)	0 (0-0)	0.7 (0.1-1.8)	0 (0-0)	0.7 (0.1-1.8)
Herring gull	1.9 (0.2-4.2)	0.4 (0-1)	0 (0-0)	0.3 (0-0.7)	0.7 (0-1.7)	2.6 (0.2-5.9)
Kittiwake (Option 1: Weighted average PCH)	5.0 (1.8-8.5)	7.8 (1.4-15)	0 (0-0)	17.5 (6.1-29.5)	0 (0-0)	30.3 (9.2-52.9)
Kittiwake (Option 2: Generic PCH)	22.6 (8.1-37.9)	35.0 (6.1-67.1)	0 (0-0)	78.5 (27.2-132.5)	0 (0-0)	136.0 (41.4-237.5)
Lesser black-backed gull	0 (0-0)	0 (0-0)	0 (0-0)	0.8 (0.1-1.8)	0 (0-0)	0.8 (0.1-1.8)
Little gull	0.1 (0-0.2)	0 (0-0)	0 (0-0)	0 (0-0)	39.3 (5.9-76.6)	39.4 (5.9-76.8)
Sandwich tern	0.1 (0-0.2)	0.1 (0-0.1)	0 (0-0)	0 (0-0)	0.1 (0-0.1)	0.1 (0-0.3)

Arctic tern

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.8.14 An estimate of 1.4 Arctic terns were predicted to be at collision risk in the breeding season. The Arctic tern breeding season mean maximum foraging range is estimated as 26 km (Woodward *et al*., 2019), while the nearest breeding colony SPA to the Array Area for this species is 40 km (Dalkey Islands SPA). Furthermore, the breeding season collision estimate (1.4) was mostly due to the August prediction (1.25) and probably reflects post-breeding passage movements which should be considered against the nonbreeding population. Therefore, the BDMPS reference population for the breeding season of 22,822 is considered appropriate for assessment (Table 12.11).

12.9.8.15 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 3,720 (22,822 x 0.163). The addition of 1.4 individuals to this would increase the mortality rate by 0.04%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation.

12.9.8.16 The collision risk for Arctic terns during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Low.

SENSITIVITY OF ARCTIC TERN

12.9.8.17 With respect to collision risk with WTG during breeding season, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.8.18 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Low** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, **Slight adverse**, which is **not significant** in EIA terms.

12.9.8.19 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.8.20 An estimate of <0.1 Arctic terns were predicted to be at collision risk in the autumn migration. The BDMPS reference population for the autumn migration period is 72,393 (Table 12.12).

12.9.8.21 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 11,800 (72,393 x 0.163). The addition of 0.1 individuals to this would increase the mortality rate by 0.001%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.8.22 The collision risk for Arctic terns during the autumn migration period season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERN

12.9.8.23 With respect to collision risk with WTG during autumn migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.8.24 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.25 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.8.26 An estimate of 0.3 Arctic terns were predicted to be at collision risk in the spring migration. The BDMPS reference population for the autumn migration period is 72,393 (Table 12.12).

12.9.8.27 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 11,800 (72,393 x 0.163). The addition of 0.3 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.8.28 The collision risk for Arctic terns during the spring migration period season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERNS

12.9.8.29 With respect to collision risk with WTG during spring migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.8.30 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.31 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.8.32 An estimate of 1.8 arctic terns were predicted to be at collision risk across all seasons. At the average baseline mortality rate for Arctic terns of 0.163 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 11,800 (72,393 x 0.163). The addition of 1.8 to this increases the mortality rate by 0.015%. The biogeographic population for arctic terns is 628,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 102,364 (628,000 x 0.163). The addition of 1.8 to this increases the mortality rate by 0.002%. Thus, the increase in background mortality is between 0.002% and 0.015%. This magnitude of increase in mortality (less than 1%) would not materially alter the background mortality of the population and would be undetectable (Parker *et al.* 2022).

12.9.8.33 The collision risk for Arctic terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERNS

12.9.8.34 With respect to collision risk with WTG during all seasons, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.8.35 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.36 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Black-headed gull

BREEDING SEASON

12.9.8.37 Almost no black-headed gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.9.8.38 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.8.39 An estimate of 17 black-headed gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for the nonbreeding season is 4,250,000 (Table 12.13).

12.9.8.40 At the average baseline mortality rate for black-headed gulls of 0.175 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during the

nonbreeding season is 743,750 (4,250,000 x 0.175). The addition of 17 to this increases the mortality rate by 0.002%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.8.41 Thus, while the proportion of the biogeographic population which is present in the Irish Sea during the winter is not known with certainty, even if only a small percentage (e.g. <5%) of the total wintering population is present, the effect would remain undetectable.

12.9.8.42 The collision risk for black-headed gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF BLACK-HEADED GULL

12.9.8.43 With respect to collision risk with WTG during nonbreeding season, overall black-headed gulls are considered to be of Low sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and low conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.8.44 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of black-headed gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.45 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

Common gull

BREEDING SEASON

12.9.8.46 The biogeographic reference population for common gull is 1,725,000 (Table 12.13). An estimate of 0.9 common gulls were predicted to be at collision risk in the breeding season. At the average baseline mortality rate for common tern of 0.258 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 445,050 (1,725,000 x 0.258). The addition of 0.9 individuals to this would increase the mortality rate by <0.001%. increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.8.47 The collision risk for common gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF COMMON GULL

12.9.8.48 With respect to collision risk with WTG during the nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.8.49 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.50 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.8.51 An estimate of 62.8 common gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for common gull is 1,725,000 (Table 12.13). Common gulls are present throughout the Irish Sea during the nonbreeding period. Jessopp *et al.*, (2018) presented a combined common gull and herring gull estimate (due to the difficulty of separating these species by eye during surveys) of up to 35,000 along the Irish Sea east coast. Large numbers of common gulls migrate from Scandinavia and northern continental Europe to Britain and Ireland during the winter, leading Wright *et al.* (2012) to estimate the total wintering population (of Britain and Ireland) as 700,000. Although no regional breakdown was provided, this indicates that the population in the Irish Sea in winter is likely to be large, and probably considerably higher than that estimated by Jessopp *et al.* (2018). If the Irish Sea hosts only 10% or more of the wintering population estimate (i.e. 10% of 700,000 = 70,000), which is very likely to be a precautionary value, then the predicted background mortality of the wintering population would be at least 18,410 at an average mortality rate of 0.258 (Table 12.14). The addition of 62.8 individuals would increase the mortality by less than 1%, which would be considered undetectable.

12.9.8.52 The collision risk for common gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF COMMON GULL

12.9.8.53 With respect to collision risk with WTG during nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.8.54 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** to **Low** and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be of **Negligible** to **Slight adverse** significance, which is **not significant** in EIA terms.

12.9.8.55 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Common tern

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.8.56 An estimate of 2.5 common terns were predicted to be at collision risk in the breeding season. The BDMPS reference population for the breeding season is 25,432 (Table 12.11).

12.9.8.57 At the average baseline mortality rate for common tern of 0.263 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 6,689 (25,432 x 0.263). The addition of 2.5 individuals to this would increase the mortality rate by 0.04%. increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.8.58 The collision risk for common terns for the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERN

12.9.8.59 With respect to collision risk with WTG during the breeding season, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.8.60 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.61 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.8.62 An estimate of 0.3 common terns were predicted to be at collision risk in the autumn migration. The BDMPS reference population for the autumn migration period is 73,739 (Table 12.12).

12.9.8.63 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 19,393 (73,739 x 0.263). The addition of 0.3 individuals to this would increase the mortality rate by 0.001%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.8.64 The collision risk for common terns during the autumn migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERN

12.9.8.65 With respect to collision risk with WTG during autumn migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.8.66 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.67 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.8.68 An estimate of 0.3 common terns were predicted to be at collision risk in the spring migration. The BDMPS reference population for the autumn migration period is 73,739 (Table 12.12).

12.9.8.69 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 19,393 (73,739 x 0.263). The addition of 0.3 individuals to this would increase the mortality rate by 0.001%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.8.70 The collision risk for common terns during the spring migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERNS

12.9.8.71 With respect to collision risk with WTG during spring migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.8.72 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.73 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.8.74 An estimate of 3.2 common terns were predicted to be at collision risk across all seasons.

12.9.8.75 At the average baseline mortality rate for common terns of 0.263 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 19,393 (73,739 x 0.263). The addition of 3.2 to this increases the mortality rate by 0.02%. The biogeographic population for common terns is 480,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 126,240 (480,000 x 0.263). The addition of 3.2 to this increases the mortality rate by 0.002%. Thus, the increase in background mortality is between 0.002% and 0.02%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.8.76 The collision risk for common terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERNS

12.9.8.77 With respect to collision risk with WTG during all seasons, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.8.78 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.79 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Herring gull

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.8.80 An estimate of 1.9 herring gull were predicted to be at collision risk in the breeding season. The breeding herring gull population was estimated to be between 18,771 and 95,175 (Table 12.11). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is between 3,229 and 16,370. The addition of 1.9 to this would increase the mortality rate by no more than 0.06% which would be undetectable.

12.9.8.81 The impact of collision risk with WTG on herring gull during the breeding season, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE HERRING GULL

12.9.8.82 With respect to collision risk with WTG during breeding season, overall herring gull are considered to be of Medium sensitivity. This is due to a combination of a high tolerance to offshore windfarms with consequent relatively high risk of collisions, medium recoverability following cessation of the effect and medium conservation value since only a small proportion of the herring gulls present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.8.83 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of herring gull is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.84 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NON-BREEDING SEASON

12.9.8.85 An estimate of 0.7 herring gulls were predicted to be at collision risk in the nonbreeding season. The nonbreeding season population was estimated to be 165,939 (Table 12.12). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is 28,541. The addition of 0.7 to this would increase the mortality rate by 0.002% which would be undetectable.

12.9.8.86 The impact of collision risk with WTG on herring gull during the nonbreeding season, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE RECEPTOR

12.9.8.87 With respect to collision risk with WTG during the nonbreeding season, overall herring gull are considered to be of Medium sensitivity. This is due to a combination of a high tolerance of offshore windfarms and a relatively high risk of collision, medium recoverability following cessation of the effect and medium conservation value since, as noted above, only a small proportion of the herring gull present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.8.88 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.89 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.8.90 An estimate of 2.6 herring gulls were predicted to be at collision risk across all seasons combined. At the average baseline mortality rate for herring gull of 0.172 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 28,541 (165,939 x 0.172). The addition of a maximum of 2.6 to this would increase the mortality rate by 0.009%. The biogeographic population for herring gull is 1,098,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 188,856 (1,098,000 x 0.191). The addition of 2.6 to this increases the mortality rate 0.001%.

12.9.8.91 The impact of collision risk with WTG on herring gulls during all seasons combined would occur throughout the lifetime of the Proposed Development with a high probability. However, the

increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE RECEPTOR

12.9.8.92 With respect to collision risk with WTG during the autumn, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance of offshore windfarms but relatively high risk of collisions, medium recoverability following cessation of the effect and medium conservation value since, as noted above, only a small proportion of the herring gulls present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.8.93 Overall, for collision risk with WTG during all seasons combined the magnitude has been assessed as **Negligible** and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.94 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Kittiwake

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.8.95 The estimated breeding season collisions for kittiwake were between 5.0 (Option 1) and 22.6 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated breeding season impact is 5.0 individuals.

12.9.8.96 The BDMPS reference population for the breeding season is between 127,721 and 383,507 (Table 12.11). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is between 19,924 and 59,827. The addition of 5.0 individuals to this would increase the mortality rate by between 0.008% to 0.02%. Increases in mortality of less than 1% are considered to be undetectable against background variations.

12.9.8.97 The collision risk for kittiwakes during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.8.98 With respect to collision risk with WTG during breeding season, overall kittiwakes are considered to be of Medium to high sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.8.99 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium** to **High**. The effect will therefore be **Not Significant** in EIA terms.

12.9.8.100 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.8.101 The estimated autumn migration collisions for kittiwake were between 7.8 (Option 1) and 35.0 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated autumn migration impact is 7.8 individuals..

12.9.8.102 The BDMPS for the autumn migration is 932,957 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 145,541. The addition of 7.8 individuals to this would increase the mortality rate by 0.005%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation.

12.9.8.103 The collision risk for kittiwakes during the autumn migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.8.104 With respect to collision risk with WTG during autumn migration, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability of offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.8.105 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.106 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.8.107 The estimated spring migration collisions for kittiwake were between 17.5 (Option 1) and 78.5 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated spring migration impact is 17.5 individuals.

12.9.8.108 The BDMPS for the spring migration is 712,897 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 111,212 (712,897 x 0.156). The addition of 17.5 individuals to this would increase the mortality rate by 0.0016%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation.

12.9.8.109 The collision risk for kittiwakes during the spring migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.8.110 With respect to collision risk with WTG during spring migration, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.8.111 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.112 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.8.113 The estimated annual collisions for kittiwake were between 30.3 (Option 1) and 136.0 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated annual impact is 30.3 individuals.

12.9.8.114 At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 111,212 (712,897 x 0.156). The addition of 30.36 to this increases the mortality rate by 0.03%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.156). The addition of 30.3 to this increases the mortality rate by 0.004%. Thus, the increase in background mortality is between 0.004% and 0.03%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.8.115 The owner and operator of the ABWP1, Arklow Energy Limited, has commenced pre-application consultation (Case Reference OC27.321635) with An Coimisiún Pleanála and the appropriate local authorities to decommission ABWP1, which has reached the end of its operating life and is not currently operational. The ABWP1 team has begun engaging with the Maritime Area Regulatory Authority (MARA) and is working closely with An Coimisiún Pleanála to agree on the details of the decommissioning and removal works. Based on the fact that the ABWP1 team has commenced the pre-application process for decommissioning we expect ABWP1 to be fully decommissioned before commencement of operation of ABWP2.

12.9.8.116 Consequently, the collision risk from the existing turbines which was previously incorporated into the baseline for ABWP2 needs to be discounted from sources of potential mortality in the ABWP2 array area. Collision risk for kittiwake was estimated for ABWP1 using the same methods applied for ABWP2 (see Volume III, Appendix 12.12: Offshore Ornithology Technical Report - Kittiwake Collision Risk Modelling at ABWP1 (RFI March 2026)). The ABWP1 annual kittiwake collision mortality was estimated to be between 10.7 (Option1, applying a weighted average PCH of 4.8% calculated using the ABWP2, Dublin Array and Codling kittiwake flight height data) and 26.3 (Option 2, using generic flight height data). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated annual impact is 10.7 individuals.This figure, which corresponds to that assessed for ABWP2 can therefore be subtracted from the annual total for ABWP2.

12.9.8.117 The addition of 19.6 (ABWP2's 30.3 minus 10.7 for ABWP1) to the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons (111,212; 712,897 x 0.156) increases the mortality rate by 0.018%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.156). The addition of 19.6 to this increases the mortality rate by 0.002%. Thus, the increase in background mortality taking into account the decommissioned ABWP1 turbines is between 0.002% and 0.018%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.8.118 In the case that ABWP1 returns to operation, potentially the ABWP1 mortality could be additional to that at ABWP2. In this case the annual kittiwake mortality would be 41.0 (10.7 plus 30.3). However, this level of annual mortality, being only slightly higher than that assessed, would not alter the conclusion (i.e. this would remain undetectable against background variations).

12.9.8.119 The collision risk for kittiwakes during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF KITTIWAKE

12.9.8.120 With respect to collision risk with WTG across the whole year, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.8.121 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** to **Low** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** to **Slight** which is **not significant** in EIA terms.

12.9.8.122 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Little gull

BREEDING SEASON

12.9.8.123 Almost no little gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.9.8.124 No mitigation is proposed for this potential impact therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.8.125 An estimate of 39.3 little gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for the nonbreeding season is 75,000 (Table 12.13).

12.9.8.126 At the average baseline mortality rate for little gulls of 0.2 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during the nonbreeding season is 15,000 (75,000 x 0.2). The addition of 39.3 to this increases the mortality rate by 0.3%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.8.127 The collision risk for little gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Low.

SENSITIVITY OF LITTLE GULL

12.9.8.128 With respect to collision risk with WTG during nonbreeding season, overall little gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and low conservation value, since SPA connectivity is expected to be low.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.8.129 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Low** and the sensitivity of little gulls is considered to be **Low**. The effect will, therefore, be **Slight adverse** significance, which is **not significant** in EIA terms.

12.9.8.130 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Collison Risk for Migratory waterbirds and terrestrial species

12.9.8.131 The risk of collisions for non-seabird migrants was assessed using the Marine Scotland migratory CRM (mCRM) developed by Hidef Surveying (2024). This work was undertaken collectively on behalf of all the Irish Phase 1 wind farms (Oriel, NISA, Dublin Array, Codling and ABWP2) and the full report is provided in Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026)). The results for ABWP2 are discussed in the current section, with the Phase 1 cumulative assessment discussed in section 12.11.4.

12.9.8.132 The mCRM tool has built in flight path routes for migrants travelling to and from the UK, but these are only partially appropriate for migration routes to and from Ireland. In recognition of this, the flight-lines in the tool were modified to make them 'Ireland centric' rather than 'UK centric'

(see Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026) for details). In combination with appropriate Irish population sizes for the species assessed this ensured the results were robust for assessing the potential collision risk at the Irish Phase 1 projects. For example, this meant that the population estimates used in the modelling were not unrealistically inflated with the inclusion of birds travelling through the Irish Sea to or from UK destinations. These UK bound birds are considered very unlikely to travel through the western Irish Sea where the Phase 1 projects are located, but rather would follow the UK coastline. In this manner the assessment provides precautionary results, since collision risks were not distributed among a larger Irish and UK population, but rather just the Irish one.

12.9.8.133 Among the species included in the mCRM, 70 species were considered for assessment, of which 27 were screened out, leaving 43 to be assessed. Species were screened out if there little or no evidence of connectivity to the western Irish Sea (e.g. for avocet, *Recurvirostra avosetta*) or has been assessed elsewhere (e.g. gannet). Details of these screening determinations are provided in Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026).

12.9.8.134 The outputs from the mCRM for ABWP2 are provided in Table 12.47.

Table 12.47: Migratory collision risks. Latin names are provided in Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026)

Species	Annual collisions	Migratory Irish Population	Percentage of population at risk of collision
Bar-tailed godwit	0.038	16,530	0.0002%
Black-tailed godwit	0.035	19,800	0.0002%
Canadian light-bellied brent goose	0.031	35,150	0.0001%
Corncrake	0.004	436	0.0009%
Common scoter	0.225	7,500	0.0030%
Curlew	0.086	35,240	0.0002%
Dunlin	0.077	45,760	0.0002%
Eider	0.051	5,660	0.0009%
Golden plover	0.178	92,060	0.0002%
Goldeneye	0.116	3,820	0.0030%
Great crested grebe	0.061	2,930	0.0021%
Great northern diver	0.006	2,240	0.0003%
Greenland white-fronted goose	0.006	9,590	0.0001%
Greenshank	0.003	1,320	0.0002%

Species	Annual collisions	Migratory Irish Population	Percentage of population at risk of collision
Grey plover	0.006	2,940	0.0002%
Hen harrier	0.003	222	0.0014%
Knot	0.029	16,270	0.0002%
Lapwing	0.2	84,690	0.0002%
Long-tailed duck	0.002	38	0.0053%
Mallard	1.605	28,230	0.0057%
Merlin	0.101	4,128	0.0024%
Oystercatcher	0.13	60,540	0.0002%
Pintail	0.05	1,570	0.0032%
Pochard	0.532	11,150	0.0048%
Purple sandpiper	0.002	660	0.0003%
Red-breasted merganser	0.07	2,430	0.0029%
Redshank	0.042	23,800	0.0002%
Red-throated diver	0.002	770	0.0003%
Ringed plover	0.02	11,660	0.0002%
Ruff	0	39	0.0000%
Sanderling	0.014	8,420	0.0002%
Scaup	0.07	2,485	0.0028%
Shelduck	0.252	10,160	0.0025%
Short-eared owl	0.078	7,440	0.0010%
Shoveler	0.113	2,240	0.0050%
Slavonian grebe	0	42	0.0000%
Snipe	8.059	3,052,500	0.0003%
Teal	1.151	35,740	0.0032%
Tufted duck	0.761	27,470	0.0028%
Turnstone	0.021	9,480	0.0002%

Species	Annual collisions	Migratory Irish Population	Percentage of population at risk of collision
Whimbrel	0	53	0.0000%
Whooper swan	0.182	15,370	0.0012%
Wigeon	1.634	55,730	0.0029%

MAGNITUDE OF IMPACT

12.9.8.135 Only four species had annual collision risk greater than one individual: mallard (1.6), snipe (8.1), teal (1.1) and wigeon (1.6). The highest number of collisions expressed as a percentage of the migratory population was for mallard, with 0.0057% of the population at risk of collision. This equates to a collision risk of one collision in over 17,500 migration movements. The magnitude of collision risk to migratory species is therefore considered to be Negligible.

MIGRATORY SPECIES SENSITIVITY

12.9.8.136 The species assessed for migratory collision risks are expected to vary in their sensitivity to collision risk, from low to high, due to different combinations of tolerance and adaptability, recoverability rates following cessation of the effect and low to high conservation values.

SIGNIFICANCE OF THE EFFECT

12.9.8.137 Overall, for collision risk with WTG by non-seabird migrants the magnitude has been assessed as **Negligible** and the sensitivity of species varies from **Low** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.8.138 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

12.9.9 Impact 3 – Project Design Option 1 (WTG model 1b) Collision risk

Operational and maintenance phase

12.9.9.1 There is a potential risk of collision with the wind turbine rotors and associated infrastructure resulting in injury or fatality to birds which fly through the Array Area whilst foraging for food or commuting between breeding sites and foraging areas. The species screened in and parameters used in the collision risk modelling are provided in section 12.9.8.

12.9.9.2 The species considered further in relation to collision risks are Arctic tern, black-headed gull, common gull, common tern, herring gull, kittiwake, and little gull. The seasonal collision estimates for these species, as well as those with annual collisions of less than 1.5 (for which no assessment is considered necessary), are presented in Table 12.48.

Table 12.48: Seasonal Collision Risk Estimates for Project Design Option 1b. Values are the Mean Number of Predicted Collisions and 95% Confidence Intervals Derived From upper and lower confidence intervals of seabird densities

Species	Breeding season	Autumn migration	Winter	Spring Migration	Nonbreeding	Annual
Arctic tern	1.6 (0.3-2.9)	0.1 (0-0.1)	0 (0-0.1)	0.3 (0-0.7)	0.4 (0-0.9)	2 (0.4-3.8)
Black-headed gull	0.1 (0-0.2)	0 (0-0)	0 (0-0)	0 (0-0)	20 (3-40)	20.1 (3-40.2)
Common gull	1 (0.1-2.5)	0 (0-0)	0 (0-0)	0 (0-0)	72.7 (10.9-146.9)	73.7 (11-149.4)
Common tern	2.9 (0.8-5.2)	0.4 (0.1-0.7)	0 (0-0)	0.4 (0.1-0.7)	0 (0-0)	3.6 (1-6.5)
Fulmar	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Gannet	0.9 (0.1-2.2)	0.3 (0-0.7)	0.1 (0-0.2)	0.1 (0-0.3)	0.5 (0.1-1.2)	1.4 (0.1-3.4)
Great black-backed gull	0 (0-0)	0 (0-0)	0 (0-0)	0.8 (0.1-2)	0 (0-0)	0.8 (0.1-2)
Herring gull	2.2 (0.2-5.1)	0.4 (0-1.1)	0 (0-0)	0.3 (0-0.8)	0.8 (0.1-1.8)	2.9 (0.2-7)
Kittiwake (Option 1: Weighted average PCH)	5.8 (2-9.7)	8.7 (1.4-16.7)	0 (0-0)	20.1 (7.3-34.7)	0 (0-0)	34.5 (10.7-61.1)
Kittiwake (Option 2: Generic PCH)	25.8 (9.1-43.5)	38.8 (6.2-75)	0 (0-0)	90.1 (33.0-155.8)	0 (0-0)	154.7 (48.2-274.3)
Lesser black-backed gull	0 (0-0)	0 (0-0)	0 (0-0)	0.8 (0.1-1.9)	0 (0-0)	0.8 (0.1-1.9)
Little gull	0.1 (0-0.3)	0 (0-0)	0 (0-0)	0 (0-0)	47 (7.8-93.8)	47.1 (7.8-94.1)
Sandwich tern	0.1 (0-0.2)	0.1 (0-0.2)	0 (0-0)	0 (0-0)	0.1 (0-0.2)	0.2 (0-0.4)

Arctic tern

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.9.3 An estimate of 1.6 Arctic terns were predicted to be at collision risk in the breeding season. The Arctic tern breeding season mean maximum foraging range is estimated as 26 km (Woodward *et al*., 2019), while the nearest SPA to the Array Area for this species is 40 km (Dalkey Islands SPA). Furthermore, the breeding season collision estimate (1.6) was mostly due to the August prediction (1.4) and probably reflects post-breeding passage movements, should be considered against the nonbreeding population. Therefore, the BDMPS reference population for the breeding season of 22,822 is considered appropriate for assessment (Table 12.11).

12.9.9.4 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 3,720 (22,822 x 0.163). The addition of 1.6 individuals to this would increase the mortality rate by 0.04%. increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation.

12.9.9.5 The collision risk for Arctic terns during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Low.

SENSITIVITY OF ARCTIC TERN

12.9.9.6 With respect to collision risk with WTG during breeding season, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.9.7 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Low** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, **Slight adverse**, which is **Not Significant** in EIA terms.

12.9.9.8 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.9.9 An estimate of 0.1 Arctic terns were predicted to be at collision risk in the autumn migration. The BDMPS reference population for the autumn migration period is 72,393 (Table 12.12).

12.9.9.10 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 11,800 (72,393 x 0.163). The addition of 0.1 individuals to this would increase the mortality rate by 0.001%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation.

12.9.9.11 The collision risk for Arctic terns during the autumn migration period season would occur throughout the lifetime of the Proposed Development with a high probability but would result in

an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERN

12.9.9.12 With respect to collision risk with WTG during autumn migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.9.13 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.14 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.9.15 An estimate of 0.3 Arctic terns were predicted to be at collision risk during spring migration. The BDMPS reference population for the autumn migration period is 72,393 (Table 12.12).

12.9.9.16 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 11,800 (72,393 x 0.163). The addition of 0.3 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation.

12.9.9.17 The collision risk for Arctic terns during the spring migration period season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERNS

12.9.9.18 With respect to collision risk with WTG during spring migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.9.19 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.20 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.9.21 An estimate of 2.0 arctic terns were predicted to be at collision risk across all seasons. At the average baseline mortality rate for Arctic terns of 0.163 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 11,800 (72,393 x 0.163). The addition of 2 to this increases the mortality rate by 0.017%. The biogeographic population for arctic terns is 628,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 102,364 (628,000 x 0.163). The addition of 2 to this increases the mortality rate by 0.002%. Thus, the increase in background mortality is between 0.002% and 0.017%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.9.22 The collision risk for Arctic terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERNS

12.9.9.23 With respect to collision risk with WTG during all seasons, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.9.24 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.25 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Black-headed gull

BREEDING SEASON

12.9.9.26 Almost no black-headed gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.9.9.27 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.9.28 The biogeographic reference population for the nonbreeding season is 4,250,000 (Table 12.13). An estimate of 20 black-headed gulls were predicted to be at collision risk in the nonbreeding season.

12.9.9.29 At the average baseline mortality rate for black-headed gulls of 0.175 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during the

nonbreeding season is 743,750 (4,250,000 x 0.175). The addition of 20 to this increases the mortality rate by 0.002%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.9.30 Thus, while the proportion of the biogeographic population which is present in the Irish Sea during the winter is not known with certainty, even if only a small percentage (e.g. <5%) of the total wintering population is present, the effect would remain undetectable.

12.9.9.31 The collision risk for black-headed gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF BLACK-HEADED GULL

12.9.9.32 With respect to collision risk with WTG during nonbreeding season, overall black-headed gulls are considered to be of Low sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and low conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.9.33 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of black-headed gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.34 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Common gull

BREEDING SEASON

12.9.9.35 The biogeographic reference population for common gull is 1,725,000 (Table 12.13). An estimate of 1.0 common gulls were predicted to be at collision risk in the breeding season. At the average baseline mortality rate for common tern of 0.258 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 445,050 (1,725,000 x 0.258). The addition of 1 individual to this would increase the mortality rate by <0.001%. increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.9.36 The collision risk for common gulls during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF COMMON GULL

12.9.9.37 With respect to collision risk with WTG during nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.9.38 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.39 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.9.40 An estimate of 72.7 common gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for common gull is 1,725,000 (Table 12.13). Common gulls are present throughout the Irish Sea during the nonbreeding period. Jessopp *et al.*, (2018) presented a combined common gull and herring gull estimate (due to the difficulty of separating these species by eye during surveys) of up to 35,000 along the Irish Sea east coast. Large numbers of common gulls migrate from Scandinavia and northern continental Europe to Britain and Ireland during the winter, leading Wright *et al.*, (2012) to estimate the total wintering population (of Britain and Ireland) as 700,000. Although no regional breakdown was provided, this indicates that the population in the Irish Sea in winter is likely to be large, and probably considerably higher than that estimated by Jessopp *et al.*, (2018). If the Irish Sea hosts only 10% or more of the wintering population estimate (i.e. 10% of 700,000 = 70,000), which is very likely to be a precautionary value, then the predicted background mortality of the wintering population would be at least 18,410 at an average mortality rate of 0.258 (Table 12.14). The addition of 72.7 individuals would increase the mortality by less than 1%, which would be considered undetectable (Parker *et al.* 2022).

12.9.9.41 The collision risk for common gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF COMMON GULL

12.9.9.42 With respect to collision risk with WTG during nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.9.43 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** to **Low** and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be of **Negligible** to **Slight adverse** significance, which is **not significant** in EIA terms.

12.9.9.44 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Common tern

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.9.45 An estimate of 2.9 common terns were predicted to be at collision risk in the breeding season. The BDMPS reference population for the breeding season is 25,432 (Table 12.11).

12.9.9.46 At the average baseline mortality rate for common tern of 0.263 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 6,689 (25,432 x 0.263). The addition of 2.9 individuals to this would increase the mortality rate by 0.04%. increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.9.47 The collision risk for common terns for the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERN

12.9.9.48 With respect to collision risk with WTG during the breeding season, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.9.49 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.50 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.9.51 An estimate of 0.4 common terns were predicted to be at collision risk in the autumn migration. The BDMPS reference population for the autumn migration period is 73,739 (Table 12.12).

12.9.9.52 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 19,393 (73,739 x 0.263). The addition of 0.4 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.9.53 The collision risk for common terns during the autumn migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERN

12.9.9.54 With respect to collision risk with WTG during autumn migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.9.55 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.56 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.9.57 An estimate of 0.4 common terns were predicted to be at collision risk in the spring migration. The BDMPS reference population for the autumn migration period is 73,739 (Table 12.12).

12.9.9.58 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 19,393 (73,739 x 0.263). The addition of 0.4 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.9.59 The collision risk for common terns during the spring migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERNS

12.9.9.60 With respect to collision risk with WTG during spring migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.9.61 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.62 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.9.63 An estimate of 3.6 common terns were predicted to be at collision risk across all seasons.

12.9.9.64 At the average baseline mortality rate for common terns of 0.263 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 19,393 (73,739 x 0.263). The addition of 3.6 to this increases the mortality rate by 0.02%. The biogeographic population for common terns is 480,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 126,240 (480,000 x 0.263). The addition of 3.6 to this increases the mortality rate by 0.003%. Thus, the increase in background mortality is between 0.003% and 0.02%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable (Parker *et al.* 2022).

12.9.9.65 The collision risk for common terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERNS

12.9.9.66 With respect to collision risk with WTG during all seasons, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.9.67 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.68 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Herring Gull

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.9.69 An estimate of 2.2 herring gulls were predicted to be at collision risk in the breeding season. The breeding gannet population was estimated to be between 18,771 and 95,175 (Table 12.11). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is between 3,229 and 16,370. The addition of 2.2 to this would increase the mortality rate by no more than 0.07% which would be undetectable.

12.9.9.70 The impact of collision risk with WTG on herring gull during the breeding season, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE HERRING GULL

12.9.9.71 With respect to collision risk with WTG during breeding season, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance to offshore windfarms with consequent relatively high risk of collisions, medium recoverability following cessation of the effect and medium conservation value since only a small proportion of the herring gulls present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.9.72 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of herring gull is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.73 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.9.74 An estimate of 0.8 herring gulls were predicted to be at collision risk in the nonbreeding season. The nonbreeding season population was estimated to be 165,939 (Table 12.12). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is 28,541. The addition of 0.8 to this would increase the mortality rate by 0.002% which would be undetectable.

12.9.9.75 The impact of collision risk with WTG on herring gulls during the nonbreeding season, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE RECEPTOR

12.9.9.76 With respect to collision risk with WTG during the nonbreeding season, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance of offshore windfarms and a relatively high risk of collision, medium recoverability following cessation of the effect and medium conservation value since, as noted above, only a small proportion of the herring gull present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.9.77 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.78 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.9.79 An estimate of 2.9 herring gulls were predicted to be at collision risk across all seasons combined. At the average baseline mortality rate for herring gull of 0.172 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 28,541 (165,939 x 0.172). The addition of a maximum of 2.9 to this would increase the mortality rate by 0.01%. The biogeographic population for herring gull is 1,098,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 188,856 (1,098,000 x 0.172). The addition of 2.9 to this increases the mortality rate 0.001%.

12.9.9.80 The impact of collision risk with WTG on herring gull during all seasons combined would occur throughout the lifetime of the Proposed Development with a high probability. However, the

increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE RECEPTOR

12.9.9.81 With respect to collision risk with WTG during all seasons, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance of offshore windfarms but relatively high risk of collisions, medium recoverability following cessation of the effect and medium conservation value since, as noted above, only a small proportion of the herring gulls present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASON

12.9.9.82 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.83 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Kittiwake

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.9.84 The estimated breeding season collisions for kittiwake were between 5.8 (Option 1) and 25.8 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated breeding season impact is 5.8 individuals.

12.9.9.85 The BDMPS reference population for the breeding season is between 127,721 and 383,507 (Table 12.11). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is between 19,924 and 59,827. The addition of 5.8 individuals to this would increase the mortality rate by between 0.01% to 0.03%. Increases in mortality of less than 1% are considered to be undetectable against background variations (Parker *et al.* 2022).

12.9.9.86 The collision risk for kittiwakes during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.9.87 With respect to collision risk with WTG during breeding season, overall kittiwakes are considered to be of Medium to high sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.9.88 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium** to **High**. The effect will therefore be **Not Significant** in EIA terms.

12.9.9.89 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.9.90 The estimated autumn migration collisions for kittiwake were between 8.7 (Option 1) and 38.8 (Option 2).). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated autumn migration impact is 8.7 individuals.

12.9.9.91 The BDMPS for the autumn migration is 932,957 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 145,541. The addition of 8.7 individuals to this would increase the mortality rate by 0.006%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.9.92 The collision risk for kittiwakes during the autumn migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.9.93 With respect to collision risk with WTG during autumn migration, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.9.94 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.95 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.9.96 The estimated spring migration collisions for kittiwake were between 20.1 (Option 1) and 90.1 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated spring migration impact is 20.1 individuals.

12.9.9.97 The BDMPS for the spring migration is 712,897 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of

mortality in the spring migration is 111,212 (712,897 x 0.156).The addition of 20.1 individuals to this would increase the mortality rate by 0.018%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.9.98 The collision risk for kittiwakes during the spring migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.9.99 With respect to collision risk with WTG during spring migration, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.9.100 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.9.101 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.9.102 The estimated annual collisions for kittiwake were between 34.5 (Option 1) and 154.7 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated annual impact is 34.5 individuals.

12.9.9.103 At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 111,212 (712,897 x 0.156). The addition of 34.5 to this increases the mortality rate by 0.031%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.156). The addition of 34.5 to this increases the mortality rate by 0.004%. Thus, the increase in background mortality is between 0.004% and 0.031%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.9.104 The owner and operator of the ABWP1, Arklow Energy Limited, has commenced pre-application consultation (Case Reference OC27.321635) with An Coimisiún Pleanála and the appropriate local authorities to decommission ABWP1, which has reached the end of its operating life and is not currently operational. The ABWP1 team has begun engaging with the Maritime Area Regulatory Authority (MARA) and is working closely with An Coimisiún Pleanála to agree on the details of the decommissioning and removal works. Based on the fact that the ABWP1 team has commenced the pre-application process for decommissioning we expect ABWP1 to be fully decommissioned before commencement of operation of ABWP2.

12.9.9.105 Consequently, the collision risk from these existing turbines which was previously incorporated into the baseline for ABWP2 needs to be discounted from sources of potential

mortality in the ABWP2 array area. Collision risk for kittiwake was estimated for ABWP1 using the same methods applied for ABWP2 (see Volume III, Appendix 12.12: Offshore Ornithology Technical Report - Kittiwake Collision Risk Modelling at ABWP1 (RFI March 2026)). The ABWP1 annual kittiwake collision mortality was estimated to be between 10.7 (Option1, applying a weighted average PCH of 4.8% calculated using the ABWP2, Dublin Array and Codling kittiwake flight height data) and 26.3 (Option 2, using generic flight height data). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated annual impact is 10.7 individuals. This figure, which corresponds to that assessed for ABWP2 can therefore be subtracted from the annual total for ABWP2.

12.9.9.106 The addition of 23.8 (ABWP2's 34.5 minus 10.7 for ABWP1) to the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons (111,212; 712,897 x 0.156) increases the mortality rate by 0.021%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.156). The addition of 23.8 to this increases the mortality rate by 0.003%. Thus, the increase in background mortality taking into account the decommissioned ABWP1 turbines is between 0.003% and 0.021%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.9.107 In the case that ABWP1 returns to operation, potentially the ABWP1 mortality could be additional to that at ABWP2. In this case the annual kittiwake mortality would be 45.2 (10.7 plus 34.5). However, this level of annual mortality, being only slightly higher than that assessed, would not alter the conclusion (i.e. this would remain undetectable against background variations).

12.9.9.108 The collision risk for kittiwakes during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF KITTIWAKE

12.9.9.109 With respect to collision risk with WTG across the whole year, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.9.110 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** to **Low** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** to **Slight** which is **not significant** in EIA terms.

12.9.9.111 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Little gull

BREEDING SEASON

12.9.9.112 Almost no little gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.9.9.113 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.9.114 An estimate of 47.0 little gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for the nonbreeding season is 75,000 (Table 12.13).

12.9.9.115 At the average baseline mortality rate for little gulls of 0.2 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during the nonbreeding season is 15,000 (75,000 x 0.2). The addition of 47 to this increases the mortality rate by 0.3%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.9.116 The collision risk for little gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Low.

SENSITIVITY OF LITTLE GULL

12.9.9.117 With respect to collision risk with WTG during nonbreeding season, overall little gulls are considered to be of low sensitivity. This is due to a combination of a high tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and low conservation value, since SPA connectivity is expected to be Low.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.9.118 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Low** and the sensitivity of little gulls is considered to be **Low**. The effect will, therefore, be **Slight adverse** significance, which is **not significant** in EIA terms.

12.9.9.119 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Collison Risk for Migratory waterbirds and terrestrial species

12.9.9.120 The assessment of this impact for Design Option 1a (section 12.9.8.136) also applies to Design Option 1b, therefore the same conclusion (**Not Significant**) applies.

12.9.10 Impact 3 – Project Design Option 2 Collision risk

12.9.10.1 There is a potential risk of collision with the wind turbine rotors and associated infrastructure resulting in injury or fatality to birds which fly through the Array Area whilst foraging for food or commuting between breeding sites and foraging areas. The species screened in and parameters used in the collision risk modelling are provided in section 12.9.8.

12.9.10.2 The species considered further in relation to worst case collision risks are Arctic tern, black-headed gull, common gull, common tern, herring gull, kittiwake, and little gull. The seasonal collision estimates for these species, as well as those with annual collisions of less than 1.5 (for which no assessment is considered necessary), are presented in Table 12.49.

Table 12.49: Seasonal Collision Risk Estimates for Project Design Option 2. Values are the Mean Number of Predicted Collisions and 95% Confidence Intervals Derived From upper and lower confidence intervals of seabird densities

Species	Breeding season	Autumn migration	Winter	Spring Migration	Nonbreeding	Annual
Arctic tern	1.6 (0.4-2.9)	0 (0-0.1)	0 (0-0.1)	0.3 (0-0.7)	0.4 (0.1-0.9)	2 (0.4-3.7)
Black-headed gull	0.1 (0-0.2)	0 (0-0)	0 (0-0)	0 (0-0)	18.9 (2.4-39)	18.9 (2.4-39.2)
Common gull	1 (0-2.2)	0 (0-0)	0 (0-0)	0 (0-0)	70.3 (10.2-139.4)	71.3 (10.2-141.6)
Common tern	2.8 (0.7-5.2)	0.4 (0.1-0.7)	0 (0-0)	0.4 (0.1-0.7)	0 (0-0)	3.6 (0.9-6.5)
Fulmar	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Gannet	0.9 (0.1-2.2)	0.3 (0-0.7)	0.1 (0-0.2)	0.1 (0-0.3)	0.5 (0-1.2)	1.4 (0.1-3.4)
Great black-headed gull	0 (0-0)	0 (0-0)	0 (0-0)	0.7 (0-1.9)	0 (0-0)	0.7 (0-1.9)
Herring gull	2.1 (0.2-4.7)	0.4 (0-1)	0 (0-0)	0.3 (0-0.7)	0.7 (0.1-1.7)	2.8 (0.2-6.5)
Kittiwake (Option 1: Weighted average PCH)	5.6 (2-9.4)	8.4 (1.8-16.5)	0 (0-0)	19.1 (6.2-33)	0 (0-0)	33.1 (10-59)
Kittiwake (Option 2)	25.1 (9.0-42.3)	37.7 (7.9-74.1)	0 (0-0)	85.9 (27.9-148.1)	0 (0-0)	148.7 (44.8-264.5)
Lesser black-backed gull	0 (0-0)	0 (0-0)	0 (0-0)	0.8 (0.1-1.9)	0 (0-0)	0.8 (0.1-1.9)
Little gull	0.1 (0-0.3)	0 (0-0)	0 (0-0)	0 (0-0)	44.4 (6.2-89.2)	44.5 (6.2-89.5)
Sandwich tern	0.1 (0-0.2)	0.1 (0-0.2)	0 (0-0)	0 (0-0)	0.1 (0-0.2)	0.2 (0-0.4)

Arctic tern

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.10.3 An estimate of 1.6 Arctic terns were predicted to be at collision risk in the breeding season. The Arctic tern breeding season mean maximum foraging range is estimated as 26 km (Woodward *et al*., 2019), while the nearest SPA to the Array Area for this species is 40 km (Dalkey Islands SPA). Furthermore, the breeding season collision estimate (1.6) was mostly due to the August prediction (1.4) and probably reflects post-breeding passage movements, should be considered against the nonbreeding population. Therefore, the BDMPS reference population for the breeding season of 22,822 is considered appropriate for assessment (Table 12.11).

12.9.10.4 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 3,720 (22,822 x 0.163). The addition of 1.6 individuals to this would increase the mortality rate by 0.04%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.5 The collision risk for Arctic terns during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Low.

SENSITIVITY OF ARCTIC TERN

12.9.10.6 With respect to collision risk with WTG during breeding season, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.10.7 Overall, for collision risk with WTG during breeding season, the magnitude has been assessed as **Low** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore be, **Slight adverse**, which is **not significant** in EIA terms.

12.9.10.8 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.10.9 An estimate of 0.1 Arctic terns were predicted to be at collision risk in the autumn migration. The BDMPS reference population for the autumn migration period is 72,393 (Table 12.12).

12.9.10.10 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 11,800 (72,393 x 0.163). The addition of 0.1 individuals to this would increase the mortality rate by 0.001%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.11 The collision risk for Arctic terns during the autumn migration period season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERN

12.9.10.12 With respect to collision risk with WTG during autumn migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.10.13 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.14 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.10.15 An estimate of 0.3 Arctic terns were predicted to be at collision risk during spring migration. The BDMPS reference population for the autumn migration period is 72,393 (Table 12.12).

12.9.10.16 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 11,800 (72,393 x 0.163). The addition of 0.3 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.17 The collision risk for Arctic terns during the spring migration period season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERNS

12.9.10.18 With respect to collision risk with WTG during spring migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.10.19 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.20 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.10.21 An estimate of 2.0 arctic terns were predicted to be at collision risk across all seasons. At the average baseline mortality rate for Arctic terns of 0.163 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 11,800 (72,393 x 0.163). The addition of 2 to this increases the mortality rate by 0.017%. The biogeographic population for arctic terns is 628,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 102,364 (628,000 x 0.163). The addition of 2 to this increases the mortality rate by 0.002%. Thus, the increase in background mortality is between 0.002% and 0.017%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.10.22 The collision risk for Arctic terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF ARCTIC TERNS

12.9.10.23 With respect to collision risk with WTG during all seasons, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.10.24 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.25 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Black-headed gull

BREEDING SEASON

12.9.10.26 Almost no black-headed gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.9.10.27 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.10.28 The biogeographic reference population for the nonbreeding season is 4,250,000 (Table 12.13). An estimate of 18.9 black-headed gulls were predicted to be at collision risk in the nonbreeding season.

12.9.10.29 At the average baseline mortality rate for black-headed gulls of 0.175 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during

the nonbreeding season is 743,750 (4,250,000 x 0.175). The addition of 18.9 to this increases the mortality rate by 0.002%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.10.30 Thus, while the proportion of the biogeographic population which is present in the Irish Sea during the winter is not known with certainty, even if only a small percentage (e.g. <5%) of the total wintering population is present, the effect would remain undetectable.

12.9.10.31 The collision risk for black-headed gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF BLACK-HEADED GULL

12.9.10.32 With respect to collision risk with WTG during nonbreeding season, overall black-headed gulls are considered to be of Low sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and low conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.10.33 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of black-headed gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.34 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Common gull

BREEDING SEASON

12.9.10.1 The biogeographic reference population for common gull is 1,725,000 (Table 12.13). An estimate of 1.0 common gulls were predicted to be at collision risk in the breeding season. At the average baseline mortality rate for common tern of 0.258 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 445,050 (1,725,000 x 0.258). The addition of 1 individual to this would increase the mortality rate by <0.001%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.2 The collision risk for common gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF COMMON GULL

12.9.10.3 With respect to collision risk with WTG during nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.10.4 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** to **Low** and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.5 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.10.6 An estimate of 71.3 common gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for common gull is 1,725,000 (Table 12.13). Common gulls are present throughout the Irish Sea during the nonbreeding period. Jessopp *et al.*, (2018) presented a combined common gull and herring gull estimate (due to the difficulty of separating these species by eye during surveys) of up to 35,000 along the Irish Sea east coast. Large numbers of common gulls migrate from Scandinavia and northern continental Europe to Britain and Ireland during the winter, leading Wright *et al.*, (2012) to estimate the total wintering population (of Britain and Ireland) as 700,000. Although no regional breakdown was provided, this indicates that the population in the Irish Sea in winter is likely to be large, and probably considerably higher than that estimated by Jessopp *et al.*, (2018). If the Irish Sea hosts only 10% or more of the wintering population estimate (i.e. 10% of 700,000 = 70,000), which is very likely to be a precautionary value, then the predicted background mortality of the wintering population would be at least 18,410 at an average mortality rate of 0.258 (Table 12.14). The addition of 71.3 individuals would increase the mortality by less than 1%, which would be considered undetectable (Parker *et al.* 2022).

12.9.10.7 The collision risk for common gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF COMMON GULL

12.9.10.8 With respect to collision risk with WTG during nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.10.9 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible to Low** and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be of **Negligible** to **Slight adverse** significance, which is **not significant** in EIA terms.

12.9.10.10 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Common tern

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.10.11 An estimate of 2.8 common terns were predicted to be at collision risk in the breeding season. The BDMPS reference population for the breeding season is 25,432 (Table 12.11).

12.9.10.12 At the average baseline mortality rate for common tern of 0.263 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 6,689 (25,432 x 0.263). The addition of 2.8 individuals to this would increase the mortality rate by 0.04%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.13 The collision risk for common terns for the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERN

12.9.10.14 With respect to collision risk with WTG during the breeding season, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.10.15 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.16 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.10.17 An estimate of 0.4 common terns were predicted to be at collision risk in the autumn migration. The BDMPS reference population for the autumn migration period is 73,739 (Table 12.12).

12.9.10.18 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 19,393 (73,739 x 0.263). The addition of 0.4 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.19 The collision risk for common terns during the autumn migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERN

12.9.10.20 With respect to collision risk with WTG during autumn migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.10.21 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.22 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.10.23 An estimate of 0.4 common terns were predicted to be at collision risk in the spring migration. The BDMPS reference population for the autumn migration period is 73,739 (Table 12.12).

12.9.10.24 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 19,393 (73,739 x 0.263). The addition of 0.4 individuals to this would increase the mortality rate by 0.002%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.25 The collision risk for common terns during the spring migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERNS

12.9.10.26 With respect to collision risk with WTG during spring migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.10.27 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.28 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.10.29 An estimate of 3.6 common terns were predicted to be at collision risk across all seasons.

12.9.10.30 At the average baseline mortality rate for common terns of 0.263 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 19,393 (73,739 x 0.263). The addition of 3.6 to this increases the mortality rate by 0.02%. The biogeographic population for common terns is 480,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 126,240 (480,000 x 0.263). The addition of 3.6 to this increases the mortality rate by 0.003%. Thus, the increase in background mortality is between 0.003% and 0.02%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable (Parker *et al.* 2022).

12.9.10.31 The collision risk for common terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF COMMON TERNS

12.9.10.32 With respect to collision risk with WTG during all seasons, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.10.33 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.34 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Herring Gull

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.10.35 An estimate of 2.1 herring gulls were predicted to be at collision risk in the breeding season. The breeding herring gull population was estimated to be between 18,771 and 95,175 (Table 12.11). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is between 3,229 and 16,370. The addition of 2.1 to this would increase the mortality rate by no more than 0.07% which would be undetectable.

12.9.10.36 The impact of collision risk with WTG on herring gull during the breeding season, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE HERRING GULL

12.9.10.37 With respect to collision risk with WTG during breeding season, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance to offshore windfarms with consequent relatively high risk of collisions, medium recoverability following cessation of the effect and medium conservation value since only a small proportion of the herring gulls present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.10.38 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of herring gull is considered to be **Medium**. The effect will, therefore, **be Not Significant** in EIA terms.

12.9.10.39 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.10.40 An estimate of 0.7 herring gulls were predicted to be at collision risk in the nonbreeding season. The nonbreeding season population was estimated to be 165,939 (Table 12.12). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is 28,541. The addition of 0.7 to this would increase the mortality rate by 0.002% which would be undetectable.

12.9.10.41 The impact of collision risk with WTG on herring gulls during the nonbreeding season, would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE RECEPTOR

12.9.10.42 With respect to collision risk with WTG during the nonbreeding season, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance of offshore windfarms and a relatively high risk of collision, medium recoverability following cessation of the effect and medium conservation value since, as noted above, only a small proportion of the herring gull present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.10.43 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Negligible** and the sensitivity of gannets is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.44 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.10.45 An estimate of 2.8 herring gulls were predicted to be at collision risk across all seasons combined. At the average baseline mortality rate for herring gull of 0.172 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 28,541 (165,939 x 0.172). The addition of a maximum of 2.8 to this would increase the mortality rate by 0.01%. The biogeographic population for herring gull is 1,098,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 188,856 (1,098,000 x 0.172). The addition of 2.8 to this increases the mortality rate 0.001%.

12.9.10.46 The impact of collision risk with WTG on herring gull during all seasons combined would occur throughout the lifetime of the Proposed Development with a high probability. However, the

increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF THE RECEPTOR

12.9.10.47 With respect to collision risk with WTG during all seasons, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey, medium recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the herring gulls present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.10.48 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.49 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Kittiwake

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.9.10.50 The estimated breeding season collisions for kittiwake were between 5.6 (Option 1) and 25.1 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated breeding season impact is 5.6 individuals.

12.9.10.51 The BDMPS reference population for the breeding season is between 133,487 and 383,507 (Table 12.11). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is between 19,924 and 59,827. The addition of 5.6 individuals to this would increase the mortality rate by between 0.01% to 0.03%. Increases in mortality of less than 1% are considered to be undetectable against background variations (Parker *et al.* 2022).

12.9.10.52 The collision risk for kittiwakes during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.10.53 With respect to collision risk with WTG during breeding season, overall kittiwakes are considered to be of Medium to High sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE BREEDING SEASON

12.9.10.54 Overall, for collision risk with WTG during breeding season the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium** to **High.** The effect will therefore be **Not Significant** in EIA terms.

12.9.10.55 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE AUTUMN MIGRATION

12.9.10.56 The estimated autumn migration collisions for kittiwake were between 8.4 (Option 1) and 37.7 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated autumn migration impact is 8.4 individuals.

12.9.10.57 The BDMPS for the autumn migration is 932,957 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 145,541. The addition of 8.4 individuals to this would increase the mortality rate by 0.006%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.58 The collision risk for kittiwakes during the autumn migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.10.59 With respect to collision risk with WTG during autumn migration, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE AUTUMN MIGRATION

12.9.10.60 Overall, for collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.61 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE SPRING MIGRATION

12.9.10.62 The estimated spring migration collisions for kittiwake were between 19.1 (Option 1) and 85.9 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated spring migration impact is 19.1 individuals.

12.9.10.63 The BDMPS for the spring migration is 712,897 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 111,212 (712,897 x 0.156). The addition of 19.1 individuals to this would increase the mortality rate by 0.017%. Increases in mortality of less than 1% are considered undetectable against background variations and therefore this indicates that this level of mortality would be undetectable against natural variation (Parker *et al.* 2022).

12.9.10.64 The collision risk for kittiwakes during the spring migration period would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF KITTIWAKE

12.9.10.65 With respect to collision risk with WTG during spring migration, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING THE SPRING MIGRATION

12.9.10.66 Overall, for collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** and the sensitivity of kittiwakes is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

12.9.10.67 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ALL SEASONS

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.9.10.68 The estimated annual collisions for kittiwake were between 33.1 (Option 1) and 148.7 (Option 2). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated annual impact is 33.1 individuals.

12.9.10.69 At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 111,212 (712,897 x 0.156). The addition of 33.1 to this increases the mortality rate by 0.03%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.174). The addition of 33.1 to this increases the mortality rate by 0.004%. Thus, the increase in background mortality is between 0.004% and 0.03%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.10.70 The owner and operator of the ABWP1, Arklow Energy Limited, has commenced pre-application consultation (Case Reference OC27.321635) with An Coimisiún Pleanála and the appropriate local authorities to decommission ABWP1, which has reached the end of its operating life and is not currently operational. The ABWP1 team has begun engaging with the Maritime Area Regulatory Authority (MARA) and is working closely with An Coimisiún Pleanála to agree on the details of the decommissioning and removal works. Based on the fact that the ABWP1 team has commenced the pre-application process for decommissioning we expect ABWP1 to be fully decommissioned before commencement of operation of ABWP2.

12.9.10.71 Consequently, the collision risk from these existing turbines which was previously incorporated into the baseline for ABWP2 needs to be discounted from sources of potential mortality in the ABWP2 array area. Collision risk for kittiwake was estimated for ABWP1 using the same methods applied for ABWP2 (see Volume III, Appendix 12.12: Offshore Ornithology Technical Report - Kittiwake Collision Risk Modelling at ABWP1 (RFI March 2026)). The ABWP1 annual kittiwake collision mortality was estimated to be between 10.7 (Option1, applying a weighted average PCH of 4.8% calculated using the ABWP2, Dublin Array and Codling kittiwake flight height data) and 26.3 (Option2, using generic flight height data). Option 1 is the recommended model to use when a sufficient sample size of site-specific flight heights is available (JNCC 2024, DCCAE 2018), therefore the estimated annual impact is 10.7 individuals. This figure, which corresponds to that assessed for ABWP2 can therefore be subtracted from the annual total for ABWP2.

12.9.10.72 The addition of 22.4 (ABWP2's 33.1 minus 10.7 for ABWP1) to the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons (111,212; 712,897 x 0.156) increases the mortality rate by 0.02%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.156). The addition of 22.4 to this increases the mortality rate by 0.003%. Thus, the increase in background mortality taking into account the decommissioned ABWP1 turbines is between 0.003% and 0.02%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.10.73 In the case that ABWP1 returns to operation, potentially the ABWP1 mortality could be additional to that at ABWP2. In this case the annual kittiwake mortality would be 43.8 (10.7 plus 33.1). However, this level of annual mortality, being only slightly higher than that assessed, would not alter the conclusion (i.e. this would remain undetectable against background variations).

12.9.10.74 The collision risk for kittiwakes during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible to Low.

SENSITIVITY OF KITTIWAKE

12.9.10.75 With respect to collision risk with WTG across the whole year, overall kittiwakes are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, medium recoverability following cessation of the effect and high conservation value since a proportion of the kittiwakes present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT DURING ALL SEASONS

12.9.10.76 Overall, for collision risk with WTG throughout the year the magnitude has been assessed as **Negligible to Low** and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Not Significant** to **Slight** which is **not significant** in EIA terms.

12.9.10.77 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Little gull

BREEDING SEASON

12.9.10.1 Almost no little gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.9.10.2 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

NONBREEDING SEASON

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.9.10.3 An estimate of 44.4 little gulls were predicted to be at collision risk in the nonbreeding season. The biogeographic reference population for the breeding season is 75,000 (Table 12.13). At the average baseline mortality rate for little gulls of 0.2 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during the nonbreeding season is 15,000 (75,000 x 0.2). The addition of 44.4 to this increases the mortality rate by 0.3%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.9.10.4 The collision risk for little gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. .However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Low.

SENSITIVITY OF LITTLE GULL

12.9.10.5 With respect to collision risk with WTG during nonbreeding season, overall little gulls are considered to be of low sensitivity. This is due to a combination of a high tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and low conservation value, since SPA connectivity is expected to be Low.

SIGNIFICANCE OF THE EFFECT DURING THE NONBREEDING SEASON

12.9.10.6 Overall, for collision risk with WTG during nonbreeding season the magnitude has been assessed as **Low** and the sensitivity of little gulls is considered to be **Low**. The effect will, therefore, be **Slight adverse** significance, which is **Not Significant** in EIA terms.

12.9.10.7 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

Collison Risk for Migratory waterbirds and terrestrial species

12.9.10.8 The assessment of this impact for Design Option 1a (section 12.9.8.136) also applies to Design Option 2, therefore the same conclusion (**Not Significant**) applies.

12.9.11 Impact 4 – Project Design Option 1a Barrier effects

Operational and maintenance phase

12.9.11.1 The presence of the wind turbines in the Array Area could potentially create a barrier for seabirds. Birds could be prevented from accessing foraging grounds and the journey to or from foraging grounds could be made more energetically expensive, particularly during the breeding season. As a consequence, the Proposed Development has the potential to result in long-term changes to bird movements.

12.9.11.2 It has been shown that some species (such as divers and scoters) avoid windfarms by making detours around wind turbine arrays which potentially increases their energy expenditure (Petersen *et al.*, 2006; Petersen and Fox, 2007; Masden *et al.*, 2010, 2012), which under some circumstances could potentially decrease survival chances. Such effects may have a greater impact on birds that regularly commute around a windfarm (e.g. birds heading to/from foraging grounds and roosting/nesting sites) than on migrants that would only have to negotiate around a

windfarm once per migratory period, or twice per annum, if flying the same return route (Speakman *et al.*, 2009; Masden *et al.*, 2012).

MAGNITUDE OF IMPACT

12.9.11.3 During the spring and autumn migration periods, the route taken by migrating individuals may change due to a barrier effect created by the presence of wind turbines within the Array Area of 63.4 km^2. Although migrating birds may have to increase their energy expenditure to circumvent the Array Area at a time when their energy budgets are typically restricted, this effect is likely to be small for one-off avoidances. Masden *et al.*, (2010, 2012) and Speakman *et al.*, (2009) calculated that the costs of one-off avoidances during migration were small, accounting for less than 2% of available fat reserves. Therefore, the magnitude of the impact on birds that only migrate (including seabirds, waders and waterbirds on passage) through the Array Area can be considered Negligible and these species have been scoped out of further assessment.

12.9.11.4 Outside of passage movement, several bird species could be susceptible to a barrier effect if the presence of wind turbines prevented access to foraging grounds or made the journey to or from foraging grounds more energetically expensive, particularly during the breeding season. Some seabird species recorded within the Array Area including guillemot, razorbill, gannet and kittiwake breed at designated SPA sites (e.g. Wicklow Head, Howth Head Coast, Ireland's Eye, Lambay Island and Saltee Islands) that are within foraging range of the Array Area and therefore could be susceptible to a barrier effect.

12.9.11.5 Although guillemots are considered to have a high sensitivity to barrier effects (Maclean *et al.*, 2009), they have a medium score (3) for habitat flexibility (Furness and Wade, 2012). Habitat flexibility scores have been used to classify a range of seabird species from 1 (use a wide range of habitats over a large area, and usually with a relatively wide range of foods) to 5 (specialise in using a very limited and predominantly inshore habitat, and generally with a narrow focus on a particular food). A medium score, such as that allocated to guillemots, means that this species has some flexibility in the choice of foraging locations and is not likely to be restricted to foraging only on the shallow Arklow Bank. Due to some flexibility in foraging habitat, the magnitude for guillemots is considered to be Negligible or Low.

12.9.11.6 Gannets and kittiwakes are considered to have a low vulnerability to barrier effects (Maclean *et al.*, 2009), as well as a low habitat flexibility score (1 to 2) so although these species breed within foraging range of the Array Area, they are unlikely to be affected by a windfarm barrier and are likely to forage in a wide range of habitats over a large area. The magnitude for gannets and kittiwakes is therefore, considered to be Negligible.

12.9.11.7 In general, the impact of a windfarm barrier is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect seabirds directly. Overall therefore, the magnitude is considered to be Negligible or Low.

SENSITIVITY OF SEABIRDS

12.9.11.8 Seabird species vary in their vulnerability to barrier effects. Some species such as gulls, fulmars, gannets and terns are considered to have a low sensitivity (Maclean *et al.*, 2009). For example, assessment of barrier effects of offshore windfarms in the Forth and Tay area for gannets breeding in the Forth Islands SPA concluded that even in a situation where windfarms were planned in close proximity to the Bass Rock gannet colony, the barrier effect for that population would be negligible (Searle *et al.*, 2014; Searle *et al.*, 2017). Other species such as divers and auks are considered to have a high sensitivity to barrier effects due to a higher wing-loading (i.e. they have a higher ratio of body weight to wing area and therefore energy expenditure during flight is likely to be higher. These species are notable by their characteristically direct flight paths) compared with other species (Maclean *et al.*, 2009).

12.9.11.9 Due to the proximity of the Array Area to land, some breeding seabird species (i.e. guillemot, gannet and kittiwake) are considered to have a high conservation value (Table 12.10) due to their connectivity with Irish SPA sites designated for breeding birds that are within foraging range of the Array Area (e.g. Wicklow Head, Howth Head Coast, Ireland's Eye, Lambay Island and Saltee Islands). Red-throated divers are also considered to have a high conservation value as they may pass through the Array Area during migration on their way to and from nonbreeding designated sites at Murrough SPA, the Raven SPA and Northern Cardigan Bay SPA.

12.9.11.10 In general, seabirds are deemed to be of low to high vulnerability, medium to high recoverability and medium to high value. The sensitivity of the receptor is therefore, considered to be Low to High.

SIGNIFICANCE OF THE EFFECT

12.9.11.11 Overall, the magnitude of the impact has been assessed as **Negligible** or **Low** and the sensitivity of seabird species is considered to range between **Low** to **High**. The effect will, therefore, be at most **Moderate adverse**. Given the range of species involved, and their varied sensitivities, together with the Project's orientation (parallel to the coast) it is considered that the risk of significant adverse barrier effects is very low and therefore this is **not significant** in EIA terms.

12.9.11.12 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

12.9.12 Impact 4 – Project Design Option 1 (WTG model 1b) Barrier effects

12.9.12.1 All impacts for Impact 4 – Barrier for Project Design Option 1b are identical with those for Project Design Option 1a as the Array Area is not affected by the different Project Design Options, as detailed in section 12.9.11.

12.9.13 Impact 4 – Project Design Option 2 Barrier effects

12.9.13.1 All impacts for Impact 4 – Barrier for Project Design Option 2 are identical with those for Project Design Option 1a as the Array Area is not affected by the different Project Design Options, as detailed in section 12.9.11.

12.10 Cumulative impacts assessment methodology

12.10.1 Methodology

12.10.1.1 The Cumulative Impact Assessment (CIA) takes into account the impacts associated with the Proposed Development together with other proposed and reasonably foreseeable projects, plans and existing and permitted projects. The projects and plans selected as relevant to the CIA presented within this Chapter are based upon the results of a screening exercise (see Volume III, Appendix 3.2: CIA Screening (Revised March 2026)). Each project and plan has been considered on a case by case basis for screening in or out of this chapter's assessment based upon effect-receptor pathways and the spatial/temporal scales involved. This includes consideration of biologically defined minimum population scales (BDMPS, Furness 2015) for nonbreeding periods, and species specific foraging ranges (and tracking studies where available) in the breeding season.

12.10.1.2 This tiered approach is adopted to provide an assessment of the Proposed Development as a whole. The tiering methodology is provided in Volume III, Appendix 3.2: CIA Screening (Revised March 2026).

12.10.1.3 All marine renewable projects have been screened out as there are none within 75km of the Proposed Development, all are very small in scale and there are no pathways for cumulative effects. All cable projects, dredging operations and coastal developments have been screened out due to their short term, localised effects and absence of cumulative pathways with the Proposed Development.

12.10.1.4 Due to the commitments made by the Developer in respect of the Foreshore Licence FS007339 and Foreshore Licence Application FS007555 (Table 12.21), FS007339 and FS007555 have been screened out of the cumulative impact assessment.

Table 12.50: List of other projects and plans considered within the cumulative impact assessment

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
Offshore Windfarms							
Tier 1							
Codling Wind Park	Application submitted	10.3	9.4	'Relevant Project'. Application submitted under the Maritime Area Planning (MAP) Act 2021.	2026 - 2029	2029 onwards	Potential for overlap with Proposed Development construction and operational and maintenance phases.
Dublin Array	Application submitted	25.8	24.9	'Relevant Project'. Application submitted under the Maritime Area Planning (MAP) Act 2021.	2029 - 2032	2032 onwards	Potential for overlap with Proposed Development construction and operational and maintenance phases.
North Irish Sea Array	Application submitted	65.1	64.1	'Relevant Project'. Application submitted under the Maritime Area Planning (MAP) Act 2021.	2027 - 2030	2030 onwards	Potential for overlap with Proposed Development construction and operational and maintenance phases.
Oriel Wind Park	Application submitted	108.1	107.2	'Relevant Project'. Application submitted under the Maritime Area Planning (MAP) Act 2021.	2028 - 2030	2030 onwards	Potential for overlap with Proposed Development construction and operational and maintenance phases.

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
Rhyl Flats	Operational	156.3	155.5	Operational windfarm comprising 25 turbines	N/A	2009 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Barrow Offshore Windfarm	Operational	208.6	207.6	Operational windfarm comprising 30 turbines	N/A	2006 to ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Gwynt y Mor Offshore Windfarm	Operational	159	158.1	Operational windfarm comprising 160 turbines	N/A	2015 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
North Hoyle	Operational	170.9	170.1	Operational windfarm comprising 30 turbines	N/A	2003 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
Walney Extension	Operational	187.1	186.1	Operational windfarm comprising 47 turbines	N/A	2018 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Burbo Bank	Operational	189.9	189.0	Operational windfarm comprising 25 turbines	N/A	2007 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Burbo Bank Extension	Operational	180.6	179.8	Operational windfarm comprising 32 turbines	N/A	2017- ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Robin Rigg Offshore Windfarm	Operational	247.3	246.3	Operational windfarm comprising 58 turbines	N/A	2010 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
West of Duddon Sands Offshore Windfarm	Operational	196.9	195.9	Operational windfarm comprising 108 turbines	N/A	2014 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Walney Offshore Windfarm	Operational	199.1	198.1	Operational windfarm comprising 102 turbines	N/A	2010 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Ormonde	Operational	207.4	206.4	Operational windfarm comprising 30 turbines	N/A	2012 – ongoing	Screened in due to ongoing impact. Located within Irish Sea with potential to contribute to impacts on regional seabird populations
Erebus Offshore Windfarm	Consented	133.3	132.7	Consented for up to 7 turbines	2025-2027	From 2028	Potential for overlap with Proposed Development construction and operational and maintenance phases
Awel y Mor Offshore Windfarm	Consented	148.5	147.6	Consented for up to 50 turbines	2026-2030	From 2031	Potential for overlap with Proposed Development

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
							construction and operational and maintenance phases
Twin Hub Offshore Windfarm	Consented	256.2	255.6	Floating test site with 4 turbines	2026	2027	Potential for overlap with Proposed Development construction and operational and maintenance phases.
Morgan Offshore Windfarm	Consented	165.3	164.3	English Round 4 project with up to 96 turbines	Uncertain, potentially 2028-2029	From 2030	Potential for overlap with Proposed Development construction and operational and maintenance phases
Morecambe Offshore Windfarm	Consented	174.2	173.3	English Round 4 project with up to 35 turbines	Uncertain, potentially 2026-2029	From 2030	Potential for overlap with Proposed Development construction and operational and maintenance phases
White Cross Windfarm	Consented	174.7	174.0	Floating turbine demonstration site with up to 8 turbines	2028	2029	Potential for overlap with Proposed Development construction and operational and maintenance phases
Tier 2							

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
Mona Offshore Windfarm	Consented	146.7	145.7	English Round 4 project with up to 107 turbines	Uncertain, potentially 2026-2028	From 2029	Potential for overlap with Proposed Development construction and operational and maintenance phases
Tier 3							
Decommissioning of ABWP1	Pre-application consultation	0	0	Proposed decommissioning of the seven existing offshore wind turbines at Arklow Bank Wind Park 1 (ABWP1). For assessment purposes, a precautionary scenario is assumed whereby decommissioning activities overlap temporally with construction of the Proposed Development. Decommissioning methods are assumed to be similar to those set out in the ABWP2 Rehabilitation Schedule.	Not defined – assumed to overlap with Proposed Development construction phase for assessment purposes.		Potential for overlap with Proposed Development construction phases

Project/Plan	Status	Distance from Array Area (km)	Distance from offshore export cable routes (km)	Description of Project/Plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Proposed Development
Valorous Offshore Windfarm	Proposed	141.9	141.3	Early stage planning	2029	From 2030	Potential overlap of operational and maintenance phases.
Mooir Vannin Offshore wind Farm	Planning application submitted	179.2	178.2	Application submitted to the Isle of Man Gov in 2025. Up to 89 WTGs	2031-2033	From 2033	Potential overlap of operational phases
Llyr 1 Windfarm	Application submitted	148.0	147.3	Floating turbine demonstration site with up to 10 turbines	2027	From 2027	Potential for overlap with Proposed Development construction and operational and maintenance phases

12.10.1.5 Table 12.51 presents the potential impacts, development phase, and the list of projects / plans with which the two Project Design Options have been cumulatively assessed.

Table 12.51: Cumulative assessment impacts, phases, scenarios, and projects to be considered cumulatively

Potential cumulative impact	Phase			Cumulative impact scenario	Justification
	C	O	D		
Disturbance and displacement	✓	✓	✓	Both Project Design Options were assessed as identical for this impact and are assessed cumulatively with the following windfarms: **Construction/decommissioning phase** **Tier 1** • Codling; • Dublin Array; • North Irish Sea Array; and • Oriel **Operational and maintenance phase** **Tier 1** • Codling; • Dublin Array; • North Irish Sea Array; • Oriel; • Barrow; • Burbo Bank; • Burbo Bank Extension; • Gwynt y Mor; • North Hoyle; • Ormonde; • Rhyl Flats; • Robin Rigg; • Walney; • Walney Extension; and • West of Duddon Sands. • Awel y Mor; • Erebus; • Twin Hub; • Morgan; • Morecambe; and • White Cross. **Operational and maintenance phase** **Tier 2** • Mona **Operational and maintenance phase** **Tier 3**	Outcome of the CIA will be greatest when the greatest number of other windfarms are considered

Potential cumulative impact	Phase C	Phase O	Phase D	Cumulative impact scenario	Justification
				• ABWP1 (decommissioning); • Mooir Vannin, • Llyr 1, and • Valorous.	
Indirect disturbance and displacement resulting from changes to prey and habitats	✓	✓	✓	Both Project Design Options were assessed as identical for this impact and are assessed cumulatively with the following windfarms: **Construction/decommissioning phase** **Tier 1** • Codling; • Dublin Array; • North Irish Sea Array; and • Oriel **Operational and maintenance phase** **Tier 1** • Codling; • Dublin Array; • North Irish Sea Array; • Oriel; • Barrow; • Burbo Bank; • Burbo Bank Extension; • Gwynt y Mor; • North Hoyle; • Ormonde; • Rhyl Flats; • Robin Rigg; • Walney; • Walney Extension; and • West of Duddon Sands. • Awel y Mor; • Erebus; • Twin Hub; • Morgan; • Morecambe; and • White Cross. **Operational and maintenance phase** **Tier 2** • Mona **Operational and maintenance phase**	Outcome of the CIA will be greatest when the greatest number of other windfarms are considered

Potential cumulative impact	Phase C	Phase O	Phase D	Cumulative impact scenario	Justification
				Tier 3 • ABWP1 (decommissioning); • Mooir Vannin, • Llyr 1, and • Valorous.	
Collision risk	×	✓	×	**Operational and maintenance phase** **Tier 1** • Codling; • Dublin Array; • North Irish Sea Array; • Oriel; • Barrow; • Burbo Bank; • Burbo Bank Extension; • Gwynt y Mor; • North Hoyle; • Ormonde; • Rhyl Flats; • Robin Rigg; • Walney; • Walney Extension; and • West of Duddon Sands. • Awel y Mor; • Erebus; • Twin Hub; • Morgan; • Morecambe; and • White Cross. **Operational and maintenance phase** **Tier 2** • Mona **Operational and maintenance phase** **Tier 3** • ABWP1 (decommissioning); • Mooir Vannin, • Llyr 1, and • Valorous.	Outcome of the CIA will be greatest when the greatest number of other windfarms are considered

12.10.1.6 Both Project Design Options (1 and 2) and associated parameters identified in Table 12.15 and Table 12.16 have been assessed for the potential to result in cumulative effects on identified receptors or receptor groups.

12.10.1.7 Barrier effects have not been included in the cumulative assessment since potential impacts for migration movements were scoped out (section 12.9.11.3) and the location of the Proposed Development, when considered alongside the other proposed Irish Sea windfarms and the location of seabird breeding colonies, would not be expected to combine with other projects to produce a cumulative barrier effect during the breeding or nonbreeding seasons.

12.11 Cumulative impact assessment

12.11.1.1 A description of the significance of cumulative effects upon offshore ornithology receptors arising from each identified impact is given below.

12.11.1.2 Impacts for the Codling, Dublin Array, North Irish Sea Array and Oriel projects (collectively referred to here as the other Phase 1 projects) have been included in this assessment, with information extracted from their respective assessments as appropriate.

12.11.2 Impact 5 – Cumulative disturbance and displacement

Construction phase

TIER 1

12.11.2.1 There is no cumulative construction effect from operational Tier 1 projects.

12.11.2.2 Vessel and helicopter movements associated with construction of the Proposed Development, together with vessel and helicopter movements associated with the construction of other offshore windfarms in the Irish Sea, may contribute to cumulative disturbance and displacement if the periods of construction of different projects overlap. Tier 1 Irish projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include Codling Wind Park, Dublin Array, North Irish Sea Array and Oriel (Table 12.50).

12.11.2.3 The species assessed for project-alone construction displacement impacts in section 12.9.2 were red-throated diver, guillemot and razorbill; these species have been assessed for cumulative effects.

12.11.2.4 Since this impact is highly dependent on the extent of temporal overlap across projects, in the absence of detailed construction timelines it is not possible to undertake a fully quantitative assessment. A highly precautionary approach would be to assume complete overlap in construction for all projects and this has been assessed, while the best case approach would be to assume no overlap. The most realistic assumption is that at most there will be a degree of construction overlap (and hence increased vessel and helicopter activity), but that it will be limited to a small number of proposed developments.

12.11.2.5 The Project-alone assessment of construction disturbance and displacement from the Array Area was conducted on the basis that the source of impact will be the centre(s) of construction activity within the windfarm (i.e. locations where turbine foundations and towers will be installed).

TIER 1 + 2

12.11.2.6 While vessel and helicopter movements associated with construction of the Proposed Development could potentially combine with those associated with the construction of other consented offshore windfarms in the Irish Sea, the spatial and temporal extent of this risk is considered to extend only to projects within the western Irish Sea (i.e. Phase 1 projects). Therefore Tier 2 projects are screened out of construction phase effects (Table 12.50).

TIER 1 + TIER 2 + TIER 3

12.11.2.7 While vessel and helicopter movements associated with construction of the Proposed Development could potentially combine with those associated with the construction of other future offshore windfarms in the Irish Sea, the spatial and temporal extent of this risk is considered to extend only to projects within the western Irish Sea (i.e. Phase 1 projects). Therefore Tier 3 projects are screened out of construction phase effects (Table 12.50). Furthermore, since ABWP1 is wholly located within the boundary of ABWP2, decommissioning of ABWP1, even if this overlaps temporally with construction of ABWP2, would not materially add to the magnitude of effects from construction of ABWP2 because birds can only be displaced once from the site. Therefore, no further consideration is required for the potential that decommissioning ABWP1 would add to a cumulative effect.

RED-THROATED DIVER

12.11.2.8 Estimated displacement mortality for red-throated diver at Tier 1 projects which assessed this impact are provided in Table 12.52.

Table 12.52: Cumulative numbers of Red-throated divers at risk of displacement mortality during construction at Tier 1 projects. All figures presented at 100% displacement and 1% mortality.

Tier	Windfarm	Autumn migration	Winter	Spring migration	Annual
1	ABWP2	0.08	0.32	0.25	0.65
1	Codling	0.64	2.0	1.8	4.44
1	NISA	0.26	0.1	0.26	0.62
Total		**0.98**	**2.42**	**2.31**	**5.79**
BDMPS		18,280	4,148	18,280	18,280
Baseline mortality rate		0.228	0.228	0.228	0.228
Natural mortality		4,168	946	4,168	4,168
Increase in mortality rate (%)		0.023	0.26	0.055	0.14
Magnitude		Negligible to Low	Low	Negligible to Low	Low
Sensitivity		High	High	High	High
Significance of Effect		Not Significant to Moderate	Moderate	Not Significant to Moderate	Moderate
Overall in EIA terms		**Not Significant**	**Not Significant**	**Not Significant**	**Not Significant**

MAGNITUDE OF IMPACT

12.11.2.9 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to construction disturbance and displacement (sections 12.9.2, 12.9.3 and 12.9.4). Given the local spatial extent and short term duration of the impact the magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.2.10 Assessed cumulatively with the projects set out in Table 12.51, the impact is predicted to be of regional spatial extent, short term duration, occurring during only comparatively short periods at each windfarm. Any consequent increase in mortality associated with this cumulative impact is considered to have undetectable effects on the populations, therefore the consequence will be very small. The magnitude is therefore, considered to be Negligible to Low for both Project Design Options, depending on the degree of overlap across projects (from none to complete), and given the nature of the impacts it is considered that there is a very low risk of a cumulative effect for red-throated divers.

SENSITIVITY OF RED-THROATED DIVER

12.11.2.11 Red-throated diver are deemed to be of high vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be high.

SIGNIFICANCE OF THE EFFECT

12.11.2.12 Across all seasons and annually the cumulative magnitude of the impact is deemed to be Negligible to Low and the sensitivity of red-throated diver is considered to be High. The effect will, therefore, be Not Significant to Moderate adverse significance, depending on the degree of overlap in construction across projects. However, overall it is considered that the likelihood that the construction phases for each of these projects will completely overlap is sufficiently small that there will not be a significant effect in EIA terms.

GUILLEMOT

12.11.2.1 Estimated displacement mortality for guillemot at Tier 1 projects which assessed this impact are provided in Table 12.52Table 12.53.

Table 12.53: Cumulative numbers of guillemot at risk of displacement mortality during construction at Tier 1 projects. All figures presented at 60% displacement and 1% mortality.

Tier	Windfarm	**Breeding**	**Non-breeding**	Annual
1	ABWP2	4.9	3.8	8.7
1	Codling	21.8	79.9	101.8
1	NISA	82.3	35.7	117.9
1	Oriel	16.1	46.7	62.8
Total		**125.1**	**166.1**	**291.2**
BDMPS		307,204 – 658,170	1,139,220	1,139,220
Baseline mortality rate		0.140	0.140	0.140

Tier	Windfarm	Breeding	Non-breeding	Annual
Natural mortality		43,008 – 92,144	159,491	159,491
Increase in mortality rate (%)		0.13-0.29	0.10	0.18
Magnitude		Negligible	Negligible	Negligible
Sensitivity		High	High	High
Significance of Effect		Not Significant	Not Significant	Not Significant
Overall in EIA terms		**Not Significant**	**Not Significant**	**Not Significant**

MAGNITUDE OF IMPACT

12.11.2.2 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to construction disturbance and displacement (sections 12.9.2, 12.9.3 and 12.9.4). Given the local spatial extent and short term duration of the impact the magnitude is considered to be Negligible for both Project Design Options.

12.11.2.3 Assessed cumulatively with the projects set out in Table 12.51, the impact is predicted to be of regional spatial extent, short term duration, occurring during only comparatively short periods at each windfarm. Any consequent increase in mortality associated with this cumulative impact is considered to have undetectable effects on the populations, therefore the consequence will be very small. The magnitude is therefore, considered to be Negligible for both Project Design Options, depending on the degree of overlap across projects (from none to complete), and given the nature of the impacts it is considered that there is a very low risk of a cumulative effect for guillemot.

SENSITIVITY OF GUILLEMOT

12.11.2.4 Guillemot are deemed to be of high vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be high.

SIGNIFICANCE OF THE EFFECT

12.11.2.5 Across all seasons and annually the cumulative magnitude of the impact is deemed to be Negligible and the sensitivity of guillemot is considered to be High. The effect will, therefore, be Not Significant, depending on the degree of overlap in construction across projects. However, overall it is considered that the likelihood that the construction phases for each of these projects will completely overlap is sufficiently small that there will not be a significant effect in EIA terms.

RAZORBILL

12.11.2.6 Estimated displacement mortality for guillemot at Tier 1 projects which assessed this impact are provided in Table 12.52 Table 12.54.

Table 12.54: Cumulative numbers of razorbill at risk of displacement mortality during construction at Tier 1 projects. All figures presented at 60% displacement and 1% mortality.

Tier	Windfarm	Breeding	Autumn	Winter	Spring	Annual
1	ABWP2	0.2	0.9	2.6	3.5	7.2
1	Codling	4.1	26.2	3.8	2.4	36.5
1	NISA	1.0	20.2	12.5	2.9	36.6
1	Oriel	4.2	0.0	0.0	0.0	12.1
Total		**9.5**	**47.3**	**18.9**	**8.8**	**92.4**
BDMPS		41,886 – 313,861	630,411	364,919	630,411	630,411
Baseline mortality rate		0.174	0.174	0.174	0.174	0.174
Natural mortality		7,288 – 54,612	109,692	63,496	109,692	109,692
Increase in mortality rate (%)		0.017-0.13	0.04	0.03	0.008	0.08
Magnitude		Negligible	Negligible	Negligible	Negligible	Negligible
Sensitivity		Medium	Medium	Medium	Medium	Medium
Significance of Effect		Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
Overall in EIA terms		**Not Significant**	**Not Significant**	**Not Significant**	**Not Significant**	**Not Significant**

MAGNITUDE OF IMPACT

12.11.2.7 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to construction disturbance and displacement (sections 12.9.2, 12.9.3 and 12.9.4). Given the local spatial extent and short term duration of the impact the magnitude is considered to be Negligible for both Project Design Options.

12.11.2.8 Assessed cumulatively with the projects set out in Table 12.51, the impact is predicted to be of regional spatial extent, short term duration, occurring during only comparatively short periods at each windfarm. Any consequent increase in mortality associated with this cumulative impact is considered to have undetectable effects on the populations, therefore the consequence will be very small. The magnitude is therefore, considered to be Negligible for both Project Design Options, depending on the degree of overlap across projects (from none to complete), and given the nature of the impacts it is considered that there is a very low risk of a cumulative effect for razorbill.

SENSITIVITY OF RAZORBILL

12.11.2.9 Razorbill are deemed to be of high vulnerability, rapid recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

SIGNIFICANCE OF THE EFFECT

12.11.2.10 Across all seasons and annually the cumulative magnitude of the impact is deemed to be Negligible and the sensitivity of razorbill is considered to be Medium. The effect will, therefore, be Not Significant, depending on the degree of overlap in construction across projects. However, overall it is considered that the likelihood that the construction phases for each of these projects will completely overlap is sufficiently small that there will not be a significant effect in EIA terms.

Operational and maintenance phase

TIER 1

12.11.2.11 The presence of operating wind turbines and maintenance activities (including vessel and helicopter movements) associated with the Proposed Development, together with that associated with other offshore windfarms in the Irish Sea, may contribute to cumulative disturbance and displacement if the operational phases of different projects overlap. Irish Tier 1 projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include: Codling Wind Park, Dublin Array, North Irish Sea Array and Oriel. Operational Tier 1 projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include operational projects in English and Welsh jurisdictions of the Irish Sea: Barrow, Burbo Bank, Burbo Bank Extension, Gwynt Y Mor, North Hoyle, Ormonde, Rhyl Flats, Robin Rigg, Walney, Walney Extension, West of Duddon Sands, Awel y Mor, Erebus, Twin Hub, Morgan, Morecambe and White Cross (Table 12.50).

TIER 1 + TIER 2

12.11.2.12 The presence of operating wind turbines and maintenance activities (including vessel and helicopter movements) associated with the Proposed Development, together with that associated with other offshore windfarms in the Irish Sea, may contribute to cumulative disturbance and displacement if the operational phases of different projects overlap. In addition to Tier 1 projects (above), other Tier 2 projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include operational projects in English and Welsh jurisdictions of the Irish Sea: Mona (Table 12.50).

TIER 1 + TIER 2 + TIER 3

12.11.2.13 The presence of operating wind turbines and maintenance activities (including vessel and helicopter movements) associated with the Proposed Development, together with that associated with other offshore windfarms in the Irish Sea, may contribute to cumulative disturbance and displacement if the operational phases of different projects overlap. In addition to Tier 1 and 2 projects (above), other Tier 3 projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include operational projects in English and Welsh jurisdictions of the Irish Sea: ABWP1 (decommissioning), Mooir Vannin and Valorous (Table 12.50).

12.11.2.14 The species assessed for project alone operational displacement impacts were red-throated diver, gannet, guillemot and razorbill; these species have been assessed for cumulative effects.

12.11.2.15 The level of data available and the practicality of combining disturbance and displacement impacts across windfarms is quite variable, reflecting the availability of relevant data for older projects and changes in the approach to assessment. Wherever possible the cumulative

assessment is quantitative (i.e. where data in an appropriate format have been obtained). Where this has not been possible (e.g. for older projects), or proposed projects for which no data are currently available, a qualitative assessment has been undertaken. The cumulative assessment presented here should be considered on the basis that it has used the correct values available at the time it was written, but that the figures used may have subsequently changed.

RED-THROATED DIVER

MAGNITUDE OF IMPACT

12.11.2.16 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to displacement during operation. The magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.2.17 The estimates of the total numbers of red-throated divers at risk of displacement from other offshore windfarms in the Irish Sea are included in Table 12.55 where red-throated divers have been reported. The totals omit windfarms for which no data were available, but they are also likely to over-estimate the numbers present due to the precautionary use of seasonal peak numbers at each site rather than average numbers, which is likely to lead to double counting as birds move through the Irish waters. For UK windfarms no seasonal figures could be found in the relevant reports, therefore only annual figures are presented.

Table 12.55: Cumulative numbers of Red-throated divers at risk of displacement from offshore windfarms in the Irish sea

Tier	Windfarm	Breeding season	Autumn migration	Nonbreeding season	Spring migration	Annual
1	NISA	-	-	-	-	-
1	Oriel	-	-	-	-	-
1	Codling	9	63	206	180	458
1	Dublin Array	-	-	-	-	-
1	Gwynt y Mor	-	-	-	-	35
1	Rhyl Flats	-	-	-	-	24
1	Burbo Bank	-	-	-	-	11
1	Burbo Bank Extension	-	-	-	-	30
1	North Hoyle	-	-	-	-	-
1	Walney Extension	-	-	-	-	53
1	West of Duddon Sands	-	-	-	-	-
1	Walney	-	-	-	-	-

Tier	Windfarm	Breeding season	Autumn migration	Nonbreeding season	Spring migration	Annual
1	Ormonde	-	-	-	-	-
1	Barrow	-	-	-	-	-
1	Robin Rigg	-	-	-	-	-
1	Awel-y-Mor	-	-	-	-	47*
1	Erebus	-	-	-	-	0
1	Twin Hub	-	-	-	-	0
1	Morgan	-	-	-	-	0
1	Morecambe	-	2	12	6	20
2	Mona	-	-	-	-	0
3	ABWP1	-	-	-	-	-
3	Mooir Vannin	-	-	46.5	121	167.5
3	Valorous	-	-	-	-	-
3	Llyr 1	0	0	0	0	0
	ABWP2 (Design Options 1 and 2)	35	45	165	130	375
	Total (Ireland + UK)	**44**	**110**	**429.5**	**437**	**1220.5**

** 47 red-throated diver reported within the array plus 8 km buffer*

12.11.2.18 The estimated annual cumulative total of red-throated divers at risk of displacement from the Proposed Development is 375 individuals, which rises to 1,220.5 individuals when including the Irish and UK Projects (Table 12.55). Most wind farms have not provided a seasonal breakdown of abundance and therefore only the annual total can be robustly assessed.

12.11.2.19 Considering a range of displacement of 90 to 100%, and mortality of displaced individuals from 1 to 10%, the estimated number of red-throated divers subject to mortality from displacement throughout the year is between 11 and 122 (Table 12.56).

Table 12.56: Cumulative Annual Displacement Matrix for Red-throated divers

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	1	2	4	5	6	7	9	10	11	12
2	2	5	7	10	12	15	17	20	22	24
3	4	7	11	15	18	22	26	29	33	37
4	5	10	15	20	24	29	34	39	44	49
5	6	12	18	24	31	37	43	49	55	61
6	7	15	22	29	37	44	51	59	66	73
7	9	17	26	34	43	51	60	68	77	85
8	10	20	29	39	49	59	68	78	88	98
9	11	22	33	44	55	66	77	88	99	110
10	12	24	37	49	61	73	85	98	110	122
20	24	49	73	98	122	146	171	195	220	244
30	37	73	110	146	183	220	256	293	330	366
50	61	122	183	244	305	366	427	488	549	610
75	92	183	275	366	458	549	641	732	824	915
100	122	244	366	488	610	732	854	976	1098	1221

12.11.2.20 At the average baseline mortality rate for red-throated divers of 0.228 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 4,168 (18,280 x 0.228). The addition of a maximum of 122 to this would increase the mortality rate by 2.9%, while the evidence-based estimate of 11 would result in an increase in mortality of 0.26%. The biogeographic population for red-throated divers is 27,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 6,156 (27,000 x 0.228). The addition of 122 to this increases the mortality rate by 1.9%, while the evidence-based estimate would be for an increase on mortality of 0.18%. If displacement mortality is no more than 5% this would result in an undetectable increase.

12.11.2.21 For both reference populations the maximum predicted increase in mortality rate is greater than the 1% threshold of detectability. However, at a more realistic, but still precautionary mortality rate of 3% the additional mortality for the BDMPS would be within the 1% threshold, and the equivalent maximum displacement mortality rate for the biogeographic population would be 5%.

12.11.2.22 If mortality of displaced birds is as high as 10% then this could have a detectable effect on the population, however while several studies have found evidence for high levels of displacement, there is no evidence that affected birds experience elevated mortality as a consequence. Indeed, recent work indicates individuals of this species have a reasonable degree of flexibility to accommodate disturbance and even in mid-winter are not needing to forage at the likely limit of their capacity in order to meet their energy requirements (Thompson *et al.* 2023). Thus, the population consequences of displacement on the population are expected to be much lower than the mortality at 10% suggests.

12.11.2.23 Therefore, given that the 1% threshold is only exceeded through a combination of highly precautionary assumptions about displacement (100% displacement and >5% mortality), it is considered that cumulative operational displacement of red-throated diver summed across the entire nonbreeding period would have an undetectable effect on the population.

12.11.2.24 Therefore, when assessed cumulatively with the projects set out in Table 12.51 and assuming a lower displacement mortality rate (e.g. up to 3%) the magnitude of cumulative impact is considered to be no more than Low for both Project Design Options.

SENSITIVITY OF RED-THROATED DIVERS

12.11.2.25 With respect to operational disturbance and displacement including all seasons, overall red-throated divers are considered to be of Medium sensitivity (see section 12.9.2.150). This is due to a combination of low adaptability and tolerance to disturbance, medium recoverability following cessation of the effect and medium conservation value since, as noted above, a proportion of the red-throated divers present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.11.2.26 Overall, for the cumulative operational disturbance and displacement across all seasons the cumulative magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of red-throated divers is considered to be **Medium**. The effect will, therefore, be **Slight adverse**, which is **not significant** in EIA terms.

GANNET

MAGNITUDE OF IMPACT

12.11.2.27 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to displacement during operation. The magnitude is considered to be Negligible for both Project Design Options.

12.11.2.28 The estimates of the total numbers of gannets at risk of displacement from other offshore windfarms in the Irish Sea are included in Table 12.57. These totals omit windfarms for which no data are available (as indicated in the table), but they are also likely to over-estimate the numbers present due to the precautionary use of seasonal peak numbers at each site rather than average numbers, which is likely to lead to double counting as birds move through the Irish Sea. For UK windfarms no seasonal figures could be found in the relevant reports, therefore only annual figures are presented.

Table 12.57: Cumulative numbers of Gannets at risk of displacement from offshore windfarms in the Irish sea. Seasonal estimates were not available for most wind farms.

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	NISA	304	265	13	582
1	Oriel	246	336	43	625
1	Codling	105	55	105	265
1	Dublin Array	700	21	27	748
1	Gwynt y Mor	-	-	-	-
1	Rhyl Flats	-	-	-	-

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	Burbo Bank Extension	-	-	-	695
1	North Hoyle	-	-	-	-
1	Walney Extension	-	-	-	433
1	West of Duddon Sands	-	-	-	431
1	Walney	-	-	-	-
1	Burbo Bank	-	-	-	-
1	Ormonde	-	-	-	199
1	Barrow	-	-	-	-
1	Robin Rigg	-	-	-	-
1	Awel-y-Mor	-	-	-	528
1	Twin Hub	-	-	-	397
1	Erebus	224	334	100	658
1	Morgan	154	65	35	254
1	Morecambe	541	14	0	555
1	White Cross				456
2	Mona	251	58	28	336
3	ABWP1	-	-	-	-
3	Mooir Vannin	318.5	160.5	20.5	499.5
3	Valorous	-	-	-	-
3	Llyr 1	246	715	65	1,026
	Proposed Development	72	43	30	145
	Total (Ireland + UK)	**3161.5**	**2066.5**	**466.5**	**8833.5**

BREEDING SEASON

12.11.2.29 The estimated breeding season cumulative total of gannets at risk of displacement from the Proposed Development is 72 individuals, which rises to 3,161 individuals when including the Irish and UK Projects (Table 12.57).

12.11.2.30 Considering a range of displacement of 60 to 80%, and mortality of displaced individuals of 1%, the estimated number of gannets subject to mortality from displacement during the breeding season is predicted to be between 19 and 25 (Table 12.58).

Table 12.58: Cumulative Breeding Season Displacement Matrix for Gannets

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	3	6	9	13	16	19	22	25	28	32
2	6	13	19	25	32	38	44	51	57	63
3	9	19	28	38	47	57	66	76	85	95
4	13	25	38	51	63	76	89	101	114	126
5	16	32	47	63	79	95	111	126	142	158
6	19	38	57	76	95	114	133	152	171	190
7	22	44	66	89	111	133	155	177	199	221
8	25	51	76	101	126	152	177	202	228	253
9	28	57	85	114	142	171	199	228	256	285
10	32	63	95	126	158	190	221	253	285	316
20	63	126	190	253	316	379	443	506	569	632
30	95	190	285	379	474	569	664	759	854	948
50	158	316	474	632	790	948	1107	1265	1423	1581
75	237	474	711	948	1186	1423	1660	1897	2134	2371
100	316	632	948	1265	1581	1897	2213	2529	2845	3162

12.11.2.31 The breeding gannet population was estimated to be between 434,033 and 509,066 (Table 12.11). At the average baseline mortality rate for gannets of 0.191 (Table 12.14), the natural mortality for this population is between 82,900 (434,033 x 0.191) and 97,232 (509,066 x 0.191). The addition of a maximum of 25 individuals to this would increase the mortality rate by 0.03% which would be undetectable (Parker *et al.* 2022).

12.11.2.32 It is evident that mortality of up to 25 gannets would not materially alter the background mortality of the population and would be undetectable. The cumulative impact of displacement and disturbance from offshore infrastructure on gannets is predicted to last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. It is predicted that the impact will affect the receptor directly. In contrast to the observed levels of displacement, there is no strong evidence that affected birds experience elevated mortality as a consequence.

12.11.2.33 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of breeding season cumulative impact is considered to be Low for both Project Design Options.

SENSITIVITY OF GANNETS

12.11.2.34 The cumulative effect on gannets is expected to last the duration of the projects, and most of the individuals affected are likely to be drawn from SPA populations and therefore gannets are

of high conservation value. Gannets are also considered to have a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey. Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, gannet is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.35 Overall, for the cumulative operational disturbance and displacement during the breeding season the magnitude has been assessed as **Low** for both design options and the sensitivity of gannet is considered to be **Medium**. The effect will, therefore, be **Slight adverse** which is **not significant** in EIA terms.

AUTUMN MIGRATION

12.11.2.36 The estimated autumn migration cumulative total of gannets at risk of displacement from the Proposed Development is 43 individuals, of which mortality was estimated to be 0. Therefore the Proposed Development makes no material contribution to cumulative displacement in the autumn migration period and no further assessment is required.

SPRING MIGRATION

12.11.2.37 The estimated spring migration cumulative total of gannets at risk of displacement from the Proposed Development is 30 individuals, of which mortality was estimated to be 0. Therefore the Proposed Development makes no material contribution to cumulative displacement in the spring migration period and no further assessment is required.

ALL SEASONS

12.11.2.38 The estimated annual cumulative total of gannets at risk of displacement from the Proposed Development is 145 individuals, which rises to 8,833 individuals when including the Irish and UK Projects (Table 12.57).

12.11.2.39 Considering a range of displacement of 60 to 80%, and mortality of displaced individuals of 1%, the estimated number of gannets subject to mortality from displacement throughout the year is predicted to be between 53 and 71 (Table 12.59).

Table 12.59: Cumulative Annual Displacement Matrix for Gannets

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	9	18	26	35	44	53	62	71	79	88
2	18	35	53	71	88	106	124	141	159	177
3	26	53	79	106	132	159	185	212	238	265
4	35	71	106	141	177	212	247	283	318	353
5	44	88	132	177	221	265	309	353	397	442
6	53	106	159	212	265	318	371	424	477	530
7	62	124	185	247	309	371	433	495	556	618
8	71	141	212	283	353	424	495	565	636	707
9	79	159	238	318	397	477	556	636	715	795
10	88	177	265	353	442	530	618	707	795	883

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
20	177	353	530	707	883	1060	1237	1413	1590	1767
30	265	530	795	1060	1325	1590	1855	2120	2385	2650
50	442	883	1325	1767	2208	2650	3092	3533	3975	4417
75	662	1325	1987	2650	3312	3975	4637	5300	5962	6625
100	883	1767	2650	3533	4417	5300	6183	7066	7950	8833

12.11.2.40 At the average baseline mortality rate for gannets of 0.191 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 123,119 (644,603 x 0.191). The addition of a maximum of 71 to this would increase the mortality rate by 0.06%. The biogeographic population for gannets is 1,180,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 225,380 (1,180,000 x 0.191). The addition of 71 to this increases the mortality rate 0.03%. Both of these increases in mortality are below the 1% threshold of detectability (Parker *et al.* 2022).

12.11.2.41 It is evident that loss of up to 71 gannets from these populations would not materially alter the background mortality of the population and would be undetectable. The cumulative impact of displacement and disturbance from offshore infrastructure on gannets is predicted to last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. It is predicted that the impact will affect the receptor directly. In contrast to the observed levels of displacement, there is no strong evidence that affected birds experience elevated mortality as a consequence.

12.11.2.42 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact is considered to be Low for both Project Design Options.

SENSITIVITY OF GANNETS

12.11.2.43 The cumulative effect on gannets is expected to last the duration of the projects, and most of the individuals affected are likely to be drawn from SPA populations and therefore gannets are of high conservation value. Gannets are also considered to have a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey. Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, gannet is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.44 Overall, for the cumulative operational disturbance and displacement across all seasons the magnitude has been assessed as **Low** for both design options and the sensitivity of gannet is considered to be **Medium**. The effect will, therefore, be **Slight adverse** which is **not significant** in EIA terms.

GUILLEMOT

MAGNITUDE OF IMPACT

12.11.2.45 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to displacement during operation. The magnitude is considered to be Negligible for both Project Design Options.

12.11.2.46 The estimates of the total numbers of guillemots at risk of displacement from offshore windfarms in the Irish Sea are included in Table 12.60. These totals omit windfarms for which no data are available (as indicated in the table), but they are also likely to over-estimate the numbers present due to the precautionary use of seasonal peak numbers at each site rather than average numbers, which is likely to lead to double counting as birds move through the Irish Sea. For many UK windfarms no seasonal figures could be found in the relevant reports, therefore only annual figures are presented.

12.11.2.47 For most UK wind farms the figures in Table 12.60 were taken from Morecambe (2025). For this project the applicant undertook a retrospective assessment for older wind farms in the Irish Sea for which no quantitative assessment was available in order to derive estimated impact numbers. Therefore these values are not the legally secured ones for these consented and operational wind farms, but instead are approximations and this should be taken into consideration when reviewing the cumulative outputs.

Table 12.60: Cumulative numbers of Guillemots at risk of displacement from offshore windfarms in the Irish sea. Note that the values for projects denoted with ' * ' are taken from Morecambe (2025).

Tier	Windfarm	Breeding season	Nonbreeding season	Annual
1	NISA	13703	26795	43468
1	Oriel	1594	4938	6532
1	Codling	3624	13340	16964
1	Dublin Array	18687	2063	20750
1	Gwynt y Mor *	149	205	354
1	Rhyl Flats *	49	68	117
1	Burbo Bank Extension *	1000	1561	2562
1	North Hoyle *	-	-	
1	Walney Extension *	4169	1927	6096
1	West of Duddon Sands *	1321	166	1487
1	Walney *	161	227	388
1	Burbo Bank *	41	58	99
1	Ormonde *	912	56	968
1	Barrow	-	-	-
1	Robin Rigg *	138	88	226

Tier	Windfarm	Breeding season	Nonbreeding season	Annual
1	Awel-y-Mor *	1569	2919	4488
1	Twin Hub *	39	217	256
1	Erebus *	3558	15324	18882
1	Morgan	4010	3824	7834
1	Morecambe	6374	8315	14689
1	White Cross *	3304	1059	4363
2	Mona	4220	3756	7976
3	ABWP1	-	-	-
3	Mooir Vannin	2111	2307	4419
3	Valorous	-	-	-
3	Llyr 1	2026	13009	15035
	Proposed Development	9010	3991	13001
	Total (Ireland + UK)	**81,769**	**106,213**	**190,600**

BREEDING SEASON

12.11.2.48 The estimated breeding season cumulative total of guillemots at risk of displacement from the Proposed Development is 9,010 individuals, which rises to 81,769 individuals when including the Irish and UK Projects (Table 12.60).

12.11.2.49 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals of 1 to 5%, the estimated number of guillemots at risk of mortality from displacement during the breeding season is predicted to be between 409 and 2,453 (Table 12.61).

Table 12.61: Cumulative Breeding Season Displacement Matrix for Guillemots

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	82	164	245	327	409	491	572	654	736	818
2	164	327	491	654	818	981	1145	1308	1472	1635
3	245	491	736	981	1227	1472	1717	1962	2208	2453
4	327	654	981	1308	1635	1962	2290	2617	2944	3271

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
5	409	818	1227	1635	2044	2453	2862	3271	3680	4088
6	491	981	1472	1962	2453	2944	3434	3925	4416	4906
7	572	1145	1717	2290	2862	3434	4007	4579	5151	5724
8	654	1308	1962	2617	3271	3925	4579	5233	5887	6542
9	736	1472	2208	2944	3680	4416	5151	5887	6623	7359
10	818	1635	2453	3271	4088	4906	5724	6542	7359	8177
20	1635	3271	4906	6542	8177	9812	11448	13083	14718	16354
30	2453	4906	7359	9812	12265	14718	17171	19625	22078	24531
50	4088	8177	12265	16354	20442	24531	28619	32708	36796	40885
75	6133	12265	18398	24531	30663	36796	42929	49061	55194	61327
100	8177	16354	24531	32708	40885	49061	57238	65415	73592	81769

12.11.2.50 The breeding guillemot population was estimated to be between 307,204 and 658,170 (Table 12.11). At the average baseline mortality rate for guillemot of 0.140 (Table 12.14), the natural mortality for this population is between 43,008 (307,204 x 0.140) and 92,144 (658,170 x 0.140). The addition of the precautionary maximum of 2,453 individuals to this would increase the mortality rate by between 2.66% and 5.70%, while at the evidence based rates of 50% and 1%, the addition of 409 would raise the mortality rate by 0.44% to 0.95%.

12.11.2.51 A detailed review of the potential effects of displacement from offshore windfarms on auks (Norfolk Vanguard Ltd, 2019) acknowledged that the impact of displacement of razorbills and guillemots by offshore windfarms is uncertain. However, the review also found that on the basis of existing information, annual mortality of adults (including impacts of existing human activities) is very low (10% and 6% per annum respectively), and that displacement of razorbills and guillemots by offshore windfarms is likely to be incomplete, may reduce with habituation, and that offshore windfarms may in the long-term increase food availability to guillemots and razorbills through providing enhanced habitat for fish populations. This suggests that impacts of displacement from offshore windfarms are unlikely to represent levels of mortality anywhere near to the 6% or 10% total annual mortality that occurs due to the combination of many natural factors plus existing human activities. Consequently, this evidence-based review recommended a precautionary maximum displacement rate of 50% for auks within an offshore windfarm and 30% within a 1km buffer, and what was considered a highly precautionary maximum mortality rate of 1%.

12.11.2.52 Trinder *et al.* (2024) conducted a study to estimate displacement rates at the operational Beatrice wind farm in Scotland across two breeding seasons. This wind farm is located close to a very large seabird breeding colony (East Caithness Cliffs SPA, minimum 13km away). The study, which controlled for the confounding effects of inter-annual variation, found no evidence that guillemot avoided operating wind turbines. Therefore, even the displacement rate of 50% can

be seen as highly precautionary, and if birds are not displaced then there is no pathway for elevated mortality. Nonetheless, as a precautionary assessment the 50% displacement and 1% mortality rates have been applied to the cumulative assessment.

12.11.2.53 The cumulative impact of displacement and disturbance from offshore infrastructure on guillemots is predicted to last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. It is predicted that the impact will affect the receptor directly.

12.11.2.54 Therefore, when assessed cumulatively with the projects set out in Table 12.51, the magnitude of breeding season cumulative impact is considered to be Low for both Project Design Options.

SENSITIVITY OF GUILLEMOTS

12.11.2.55 The effect on guillemots is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non-SPA populations and therefore guillemots are of medium conservation value. Recent monitoring studies have indicated guillemots are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of guillemots around the existing ABWP1 turbines (Volume III, Appendix 12.8: Offshore Ornithology Technical Report - Seabird Spatial Distribution Maps (Revised March 2026). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, guillemot is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.56 Overall, for the cumulative operational disturbance and displacement during the breeding season the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of guillemot is considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

NON-BREEDING SEASON

12.11.2.57 The estimated non-breeding season cumulative total of guillemots at risk of displacement from the Proposed Development is 3,991 individuals, which rises to 106,213 individuals when including the Irish and UK Projects (Table 12.60).

12.11.2.58 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals of 1 to 3%, the estimated number of guillemots at risk of mortality from displacement during the breeding season is predicted to be between 531 and 1,912 (Table 12.62).

Table 12.62: Cumulative Non-breeding Season Displacement Matrix for Guillemots

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	106	212	319	425	531	637	743	850	956	1062
2	212	425	637	850	1062	1275	1487	1699	1912	2124
3	319	637	956	1275	1593	1912	2230	2549	2868	3186
4	425	850	1275	1699	2124	2549	2974	3399	3824	4249
5	531	1062	1593	2124	2655	3186	3717	4249	4780	5311
6	637	1275	1912	2549	3186	3824	4461	5098	5736	6373
7	743	1487	2230	2974	3717	4461	5204	5948	6691	7435

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
8	850	1699	2549	3399	4249	5098	5948	6798	7647	8497
9	956	1912	2868	3824	4780	5736	6691	7647	8603	9559
10	1062	2124	3186	4249	5311	6373	7435	8497	9559	10621
20	2124	4249	6373	8497	10621	12746	14870	16994	19118	21243
30	3186	6373	9559	12746	15932	19118	22305	25491	28678	31864
50	5311	10621	15932	21243	26553	31864	37175	42485	47796	53107
75	7966	15932	23898	31864	39830	47796	55762	63728	71694	79660
100	10621	21243	31864	42485	53107	63728	74349	84970	95592	106213

12.11.2.59 The BDMPS for guillemots during the nonbreeding season was estimated at 1,316,309 individuals (Table 12.12). At the average baseline mortality rate for guillemot of 0.140 (Table 12.14), the number of individuals expected to be at risk of mortality in the nonbreeding season is 184,283 (1,316,309 x 0.14). The addition of up to 1,912 individuals to this would increase the mortality rate by 1.03%. Therefore, even at the highly precautionary rates of 60% displaced and 3% mortality the background mortality rate would be increased by only 1% (the threshold below which additional mortality is considered to have an undetectable effect), this magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.2.60 A detailed review of the potential effects of displacement from offshore windfarms on auks (Norfolk Vanguard Ltd 2019) acknowledged that the impact of displacement of razorbills and guillemots by offshore windfarms is uncertain. However, the review also found that on the basis of existing information, annual mortality of adults (including impacts of existing human activities) is very low (10% and 6% per annum respectively), and that displacement of razorbills and guillemots by offshore windfarms is likely to be incomplete, may reduce with habituation, and that offshore windfarms may in the long-term increase food availability to guillemots and razorbills through providing enhanced habitat for fish populations. This suggests that impacts of displacement from offshore windfarms are unlikely to represent levels of mortality anywhere near to the 6% or 10% total annual mortality that occurs due to the combination of many natural factors plus existing human activities. Consequently, this evidence-based review recommended a precautionary maximum displacement rate of 50% for auks within an offshore windfarm and 30% within a 1km buffer, and what was considered a highly precautionary maximum mortality rate of 1%.

12.11.2.61 The cumulative impact of displacement and disturbance from offshore infrastructure on guillemots is predicted to last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. It is predicted that the impact will affect the receptor directly.

12.11.2.62 Therefore, when assessed cumulatively with the projects set out in Table 12.51, the magnitude of non-breeding season cumulative impact is considered to be Negligible for both Project Design Options.

SENSITIVITY OF GUILLEMOTS

12.11.2.63 Guillemots are considered to have a medium vulnerability to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Langston (2010), an interpretation of the Furness and Wade (2012) species concern

index value in the context of disturbance and/or displacement from a habitat, and the meta-analysis of avoidance and attraction responses of seabirds to offshore windfarms by Dierschke *et al.*, (2016).

12.11.2.64 With respect to operational disturbance and displacement during the nonbreeding season, overall guillemots are considered to be of Medium sensitivity. This is due to a combination of low adaptability and tolerance to disturbance, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING NONBREEDING SEASON

12.11.2.65 Overall, for the cumulative operational disturbance and displacement during the non-breeding season the magnitude has been assessed as **Negligible** for both Project Design Options and the sensitivity of guillemot is considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

ANNUAL

MAGNITUDE OF IMPACT

12.11.2.66 The estimated annual cumulative total of guillemot at risk of displacement from the Proposed Development is 13,001 individuals, which rises to 190,600 individuals when including the Irish and UK Projects (Table 12.60).

12.11.2.67 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals from 1 to 5% in the breeding season and 1 to 3% in the nonbreeding season, the estimated number of guillemots subject to mortality from displacement throughout the year is up to a maximum of 4,070, with an evidence based estimate (50% displaced. 1% mortality) of 865. At the average baseline mortality rate of 0.140 (Table 12.14) the number of individuals expected to die from the largest BDMPS population in a year is season is 184,283 (1,316,309 x 0.14). The addition of 4,070 to this would increase the mortality rate by 2.2%, while using the more realistic, but still precautionary estimate of 865 individuals, the background mortality rate would increase by 0.47%. Based on the annual biogeographic population with connectivity to UK waters of 4,125,000 (Furness 2015), 577,500 individuals would be expected to die; the addition of 4,070 to this would increase the mortality rate by 0.70%, while using the more realistic, but still precautionary estimate of 772 the background mortality rate would increase by 0.15%.

12.11.2.68 A detailed review of the potential effects of displacement from offshore windfarms on auks (Norfolk Vanguard Ltd 2019) acknowledged that the impact of displacement of razorbills and guillemots by offshore windfarms is uncertain. However, the review also found that on the basis of existing information, annual mortality of adults (including impacts of existing human activities) is very low (10% and 6% per annum respectively), and that displacement of razorbills and guillemots by offshore windfarms is likely to be incomplete, may reduce with habituation, and that offshore windfarms may in the long-term increase food availability to guillemots and razorbills through providing enhanced habitat for fish populations. This suggests that impacts of displacement from offshore windfarms are unlikely to represent levels of mortality anywhere near to the 6% or 10% total annual mortality that occurs due to the combination of many natural factors plus existing human activities. Consequently, this evidence-based review recommended a precautionary maximum displacement rate of 50% for auks within an offshore windfarm and 30% within a 1km buffer, and what was considered a highly precautionary maximum mortality rate of 1%. Therefore, on the basis of these robust but highly precautionary displacement and mortality rates, this would result in an increase in background mortality of less than 1% in the Irish Sea population.

12.11.2.69 The cumulative operational disturbance and displacement effect will last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. The best available evidence indicates that additional mortality will be less than 1% (see above). Thus, the population consequences of displacement on the population are expected to be undetectable.

12.11.2.70 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact is considered to be Low for both Project Design Options.

SENSITIVITY OF GUILLEMOTS

12.11.2.71 The effect on guillemots is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non-SPA populations and therefore guillemots are of medium conservation value. Recent monitoring studies have indicated guillemots are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of guillemots around the existing ABWP1 turbines (Volume III, Appendix 12.8: Offshore Ornithology Technical Report - Seabird Spatial Distribution Maps (Revised March 2026)). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, guillemot is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.72 Overall, for the cumulative operational disturbance and displacement across all seasons the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of guillemot is considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

RAZORBILL

MAGNITUDE OF IMPACT

12.11.2.73 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to displacement during operation. The magnitude is considered to be Negligible for both Project Design Options.

12.11.2.74 The estimates of the total numbers of razorbills at risk of displacement from other offshore windfarms in the Irish Sea are included in Table 12.63. These totals omit windfarms for which no data are available (as indicated in the table), but they are also likely to over-estimate the numbers present due to the precautionary use of seasonal peak numbers at each site rather than average numbers, which is likely to lead to double counting as birds move through the Irish Sea. For UK windfarms no seasonal figures could be found in the relevant reports, therefore only annual figures are presented.

Table 12.63: Cumulative numbers of Razorbills at risk of displacement from offshore windfarms in the Irish sea (seasonal estimates were not available for most wind farms)

Tier	Windfarm	Breeding season	Autumn migration	Nonbreeding season	Spring migration	Annual
1	NISA	168	3371	483	2079	6101
1	Oriel	353	962	512	859	2686

Tier	Windfarm	Breeding season	Autumn migration	Nonbreeding season	Spring migration	Annual
1	Codling	675	4360	640	409	6084
1	Dublin Array	1068	2070	281	478	3897
1	Gwynt y Mor	-	-	-	-	455
1	Rhyl Flats	-	-	-	-	-
1	Burbo Bank Extension	-	-	-	-	93
1	North Hoyle	-	-	-	-	2354
1	Walney Extension	-	-	-	-	4016
1	West of Duddon Sands	-	-	-	-	202
1	Walney	-	-	-	-	-
1	Burbo Bank	-	-	-	-	360
1	Ormonde	-	-	-	-	174
1	Barrow	-	-	-	-	-
1	Robin Rigg	-	-	-	-	63
1	Awel-y-Mor	-	-	-	-	692
1	Twin Hub	-	-	-	-	65
1	Erebus	103	1228	566	460	2357
1	Morgan	35	254	1170	328	1787
1	Morecambe	252	694	651	382	1979
1	White Cross					786
2	Mona	83	91	421	1924	2519
3	ABWP1	-	-	-	-	692
3	Mooir Vannin	76	653	213	1193	2135

Tier	Windfarm	Breeding season	Autumn migration	Nonbreeding season	Spring migration	Annual
3	Valorous	-	-	-	-	-
3	Llyr	21	1888	493	257	2659
	Proposed Development	488	2570	2558	3341	8957
	Total (Ireland + UK)	**3322**	**18141**	**7988**	**11710**	**51113**

BREEDING SEASON

12.11.2.75 The estimated breeding season cumulative total of razorbills at risk of displacement from the Proposed Development is 488 individuals, which rises to 3,322 individuals when including the Irish and UK Projects (Table 12.63).

12.11.2.76 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals from 1 to 5%, the estimated number of razorbills subject to mortality from displacement during the breeding season is up to a maximum of 100, with the evidence based estimate (50% displaced. 1% mortality) of 17 (Table 12.64).

Table 12.64: Cumulative Breeding Season Displacement Matrix for Razorbills

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	3	7	10	13	17	20	23	27	30	33
2	7	13	20	27	33	40	47	53	60	66
3	10	20	30	40	50	60	70	80	90	100
4	13	27	40	53	66	80	93	106	120	133
5	17	33	50	66	83	100	116	133	149	166
6	20	40	60	80	100	120	140	159	179	199
7	23	47	70	93	116	140	163	186	209	233
8	27	53	80	106	133	159	186	213	239	266
9	30	60	90	120	149	179	209	239	269	299
10	33	66	100	133	166	199	233	266	299	332
20	66	133	199	266	332	399	465	532	598	664
30	100	199	299	399	498	598	698	797	897	997
50	166	332	498	664	831	997	1163	1329	1495	1661
75	249	498	747	997	1246	1495	1744	1993	2242	2492
100	332	664	997	1329	1661	1993	2325	2658	2990	3322

12.11.2.77 The BDMPS for razorbills during the breeding season was estimated at between 41,886 and 313,861 individuals (Table 12.11). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is between 7,288 and 54,611. The addition of 100 to this would increase the mortality rate by

0.18% to 1.35%, while using the more realistic, but still precautionary estimate of 17 individuals the background mortality rate would increase by no more than 0.23%.

12.11.2.78 A detailed review of the potential effects of displacement from offshore windfarms on auks (Norfolk Vanguard Ltd 2019) acknowledged that the impact of displacement of razorbills and guillemots by offshore windfarms is uncertain. However, the review also found that on the basis of existing information, annual mortality of adults (including impacts of existing human activities) is very low (10% and 6% per annum respectively), and that displacement of razorbills and guillemots by offshore windfarms is likely to be incomplete, may reduce with habituation, and that offshore windfarms may in the long-term increase food availability to guillemots and razorbills through providing enhanced habitat for fish populations. This suggests that impacts of displacement from offshore windfarms are unlikely to represent levels of mortality anywhere near to the 6% or 10% total annual mortality that occurs due to the combination of many natural factors plus existing human activities. Consequently, this evidence-based review recommended a precautionary maximum displacement rate of 50% for auks within an offshore windfarm and 30% within a 1km buffer, and what was considered a highly precautionary maximum mortality rate of 1%.

12.11.2.79 Trinder *et al.* (2024) conducted a study to estimate displacement rates at the operational Beatrice wind farm in Scotland across two breeding seasons. This wind farm is located close to a very large seabird breeding colony (East Caithness Cliffs SPA, minimum 13km away). The study, which controlled for the confounding effects of inter-annual variation, found no evidence that razorbills avoid operating wind turbines. Therefore, even the displacement rate of 50% can be seen as highly precautionary, and if birds are not displaced then there is no pathway for elevated mortality. Nonetheless, as a precautionary assessment the 50% displacement and 1% mortality rates have been applied to the cumulative assessment.

12.11.2.80 The cumulative operational disturbance and displacement effect will last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. The best available evidence indicates that additional mortality will be less than 1% (see above). Thus, the population consequences of displacement on the population are expected to be undetectable.

12.11.2.81 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact is considered to be Low for both Project Design Options.

SENSITIVITY OF RAZORBILLS

12.11.2.82 The effect on razorbills is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non SPA populations and therefore razorbills are of medium conservation value. Recent monitoring studies have indicated razorbills are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of razorbills around the existing ABWP 1 turbines (Tech Annex 12.08). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, razorbill is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.83 Overall, for the cumulative operational disturbance and displacement during the breeding season the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of razorbills are considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

AUTUMN MIGRATION

12.11.2.84 The estimated autumn migration cumulative total of razorbills at risk of displacement from the Proposed Development is 2,570 individuals, which rises to 18,141 individuals when including the Irish and UK Projects (Table 12.63).

12.11.2.85 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals from 1 to 3%, the estimated number of razorbills subject to mortality from displacement during the autumn migration season is up to a maximum of 327, with the evidence based estimate (50% displaced. 1% mortality) of 91 (Table 12.65).

Table 12.65: Cumulative Autumn migration Displacement Matrix for Razorbills

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	18	36	54	73	91	109	127	145	163	181
2	36	73	109	145	181	218	254	290	327	363
3	54	109	163	218	272	327	381	435	490	544
4	73	145	218	290	363	435	508	581	653	726
5	91	181	272	363	454	544	635	726	816	907
6	109	218	327	435	544	653	762	871	980	1088
7	127	254	381	508	635	762	889	1016	1143	1270
8	145	290	435	581	726	871	1016	1161	1306	1451
9	163	327	490	653	816	980	1143	1306	1469	1633
10	181	363	544	726	907	1088	1270	1451	1633	1814
20	363	726	1088	1451	1814	2177	2540	2903	3265	3628
30	544	1088	1633	2177	2721	3265	3810	4354	4898	5442
50	907	1814	2721	3628	4535	5442	6349	7256	8163	9071
75	1361	2721	4082	5442	6803	8163	9524	10885	12245	13606
100	1814	3628	5442	7256	9071	10885	12699	14513	16327	18141

12.11.2.86 The BDMPS for razorbills during autumn migration was estimated at 630,411 individuals (Table 12.12). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals expected to be at risk of mortality during autumn migration is 109,692. The addition of a maximum of 327 individuals to this would increase the mortality rate by 0.30%, while using the more realistic, but still precautionary estimate of 91 individuals the background mortality rate would increase by no more than 0.08%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.2.87 The cumulative operational disturbance and displacement effect will last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. The best available evidence indicates that additional mortality will be less than 1%. Thus, the population consequences of displacement on the population are expected to be undetectable.

12.11.2.88 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact in the autumn migration period is considered to be Low for both Project Design Options.

SENSITIVITY OF RAZORBILLS

12.11.2.89 The effect on razorbills is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non SPA populations and therefore razorbills are of medium conservation value. Recent monitoring studies have indicated razorbills are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of razorbills around the existing ABWP 1 turbines (Tech Annex 12.8). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, razorbill is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.90 Overall, for the cumulative operational disturbance and displacement during the autumn migration period the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of razorbills are considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

MIDWINTER

12.11.2.91 The estimated midwinter cumulative total of razorbills at risk of displacement from the Proposed Development is 2,558 individuals, which rises to 7,988 individuals when including the Irish and UK Projects (Table 12.63).

12.11.2.92 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals from 1 to 3%, the estimated number of razorbills subject to mortality from displacement during the mid-winter period is up to a maximum of 144, with the evidence based estimate (50% displaced. 1% mortality) of 40 (Table 12.66).

Table 12.66: Cumulative mid-winter Displacement Matrix for Razorbills

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	8	16	24	32	40	48	56	64	72	80
2	16	32	48	64	80	96	112	128	144	160
3	24	48	72	96	120	144	168	192	216	240
4	32	64	96	128	160	192	224	256	288	320
5	40	80	120	160	200	240	280	320	359	399
6	48	96	144	192	240	288	335	383	431	479
7	56	112	168	224	280	335	391	447	503	559
8	64	128	192	256	320	383	447	511	575	639
9	72	144	216	288	359	431	503	575	647	719
10	80	160	240	320	399	479	559	639	719	799
20	160	320	479	639	799	959	1118	1278	1438	1598
30	240	479	719	959	1198	1438	1677	1917	2157	2396
50	399	799	1198	1598	1997	2396	2796	3195	3595	3994
75	599	1198	1797	2396	2996	3595	4194	4793	5392	5991
100	799	1598	2396	3195	3994	4793	5592	6390	7189	7988

12.11.2.93 The BDMPS for razorbills during the winter period was estimated at 364,919 individuals (Table 12.12). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the

number of individuals expected to be at risk of mortality during the mid-winter period is 63,496. The addition of a maximum of 144 individuals to this would increase the mortality rate by 0.23%, while using the more realistic, but still precautionary estimate of 40 individuals the background mortality rate would increase by no more than 0.06%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.2.94 The cumulative operational disturbance and displacement effect will last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. The best available evidence indicates that additional mortality will be less than 1%. Thus, the population consequences of displacement on the population are expected to be undetectable.

12.11.2.95 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact in the mid-winter period is considered to be Low for both Project Design Options.

SENSITIVITY OF RAZORBILLS

12.11.2.96 The effect on razorbills is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non SPA populations and therefore razorbills are of medium conservation value. Recent monitoring studies have indicated razorbills are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of razorbills around the existing ABWP 1 turbines (Tech Annex 12.8). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, razorbill is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.97 Overall, for the cumulative operational disturbance and displacement during the midwinter period the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of razorbills are considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

SPRING MIGRATION

12.11.2.98 The estimated spring migration cumulative total of razorbills at risk of displacement from the Proposed Development is 3,341 individuals, which rises to 11,710 individuals when including the Irish and UK Projects (Table 12.63).

12.11.2.99 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals from 1 to 3%, the estimated number of razorbills subject to mortality from displacement during the spring migration season is up to a maximum of 211, with the evidence based estimate (50% displaced. 1% mortality) of 59 (Table 12.67).

Table 12.67: Cumulative Spring migration Displacement Matrix for Razorbills

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
1	12	23	35	47	59	70	82	94	105	117
2	23	47	70	94	117	141	164	187	211	234
3	35	70	105	141	176	211	246	281	316	351
4	47	94	141	187	234	281	328	375	422	468
5	59	117	176	234	293	351	410	468	527	586

Mortality (%)	Displacement (%)									
	10	20	30	40	50	60	70	80	90	100
6	70	141	211	281	351	422	492	562	632	703
7	82	164	246	328	410	492	574	656	738	820
8	94	187	281	375	468	562	656	749	843	937
9	105	211	316	422	527	632	738	843	949	1054
10	117	234	351	468	586	703	820	937	1054	1171
20	234	468	703	937	1171	1405	1639	1874	2108	2342
30	351	703	1054	1405	1757	2108	2459	2810	3162	3513
50	586	1171	1757	2342	2928	3513	4099	4684	5270	5855
75	878	1757	2635	3513	4391	5270	6148	7026	7904	8783
100	1171	2342	3513	4684	5855	7026	8197	9368	10539	11710

12.11.2.100 The BDMPS for razorbills during spring migration was estimated at 630,411 individuals (Table 12.12). At the average baseline mortality rate for razorbill of 0.174 (Table 12.14), the number of individuals expected to be at risk of mortality during autumn migration is 109,692. The addition of a maximum of 211 individuals to this would increase the mortality rate by 0.19%, while using the more realistic, but still precautionary estimate of 59 individuals the background mortality rate would increase by no more than 0.05%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.2.101 The cumulative operational disturbance and displacement effect will last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. The best available evidence indicates that additional mortality will be less than 1%. Thus, the population consequences of displacement on the population are expected to be undetectable.

12.11.2.102 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact in the spring migration period is considered to be Low for both Project Design Options.

SENSITIVITY OF RAZORBILLS

12.11.2.103 The effect on razorbills is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non SPA populations and therefore razorbills are of medium conservation value. Recent monitoring studies have indicated razorbills are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of razorbills around the existing ABWP 1 turbines (Tech Annex 12.8). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative operational disturbance and displacement throughout the year, razorbill is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.104 Overall, for the cumulative operational disturbance and displacement during the spring migration period the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of razorbills are considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

ANNUAL

MAGNITUDE OF IMPACT

12.11.2.105 The estimated annual cumulative total of razorbill at risk of displacement from the Proposed Development is 8,957 individuals, which rises to 51,113 individuals when including the Irish and UK Projects (Table 12.60).

12.11.2.106 Considering a range of displacement of 50 to 60%, and mortality of displaced individuals from 1 to 5% in the breeding season and 1 to 3% in the nonbreeding season, the estimated number of razorbills subject to mortality from displacement throughout the year is up to a maximum of 782, with an evidence based estimate (50% displaced. 1% mortality) of 256. At the average baseline mortality rate of 0.174 (Table 12.14) the number of individuals expected to die from the largest BDMPS population in a year is season is 109,692 (630,411 x 0.174). The addition of 782 to this would increase the mortality rate by 0.71%, while using the more realistic, but still precautionary estimate of 256 individuals, the background mortality rate would increase by 0.23%. The biogeographic population for razorbills is 1,707,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 297,018 (1,707,000 x 0.174). The addition of up to 782 to this would increase the mortality rate by 0.26%, while using the more realistic, but still precautionary estimate of 256 the background mortality rate would increase by 0.09%.

12.11.2.107 A detailed review of the potential effects of displacement from offshore windfarms on auks (Norfolk Vanguard Ltd 2019) acknowledged that the impact of displacement of razorbills and guillemots by offshore windfarms is uncertain. However, the review also found that on the basis of existing information, annual mortality of adults (including impacts of existing human activities) is very low (10% and 6% per annum respectively), and that displacement of razorbills and guillemots by offshore windfarms is likely to be incomplete, may reduce with habituation, and that offshore windfarms may in the long-term increase food availability to guillemots and razorbills through providing enhanced habitat for fish populations. This suggests that impacts of displacement from offshore windfarms are unlikely to represent levels of mortality anywhere near to the 6% or 10% total annual mortality that occurs due to the combination of many natural factors plus existing human activities. Consequently, this evidence-based review recommended a precautionary maximum displacement rate of 50% for auks within an offshore windfarm and 30% within a 1km buffer, and what was considered a highly precautionary maximum mortality rate of 1%. Therefore, on the basis of these robust but highly precautionary displacement and mortality rates, this would result in an increase in background mortality of less than 1% in the Irish Sea population.

12.11.2.108 The cumulative operational disturbance and displacement effect will last for the lifetime of the projects (assuming no habituation occurs) and on the basis of current best evidence about this species the effect is considered highly likely to occur. The best available evidence indicates that additional mortality will be less than 1% (see above). Thus, the population consequences of displacement on the population are expected to be undetectable.

12.11.2.109 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact is considered to be Low for both Project Design Options.

SENSITIVITY OF RAZORBILLS

12.11.2.110 The effect on razorbills is expected to last the duration of the projects, and the individuals affected are likely to be drawn from both SPA and non SPA populations and therefore razorbills are of medium conservation value. Recent monitoring studies have indicated razorbills are quite tolerant of wind turbines (MacArthur Green 2023) and this can also be seen in the distribution of razorbills around the existing ABWP 1 turbines (Tech Annex 12.08). Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with

respect to cumulative operational disturbance and displacement throughout the year, razorbill is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.2.111 Overall, for the cumulative operational disturbance and displacement across all seasons the magnitude has been assessed as **Low** for both Project Design Options and the sensitivity of guillemot is considered to be **Medium**. The cumulative effect will, therefore, be of **Slight adverse** significance, which is **not significant** in EIA terms.

Decommissioning phase

12.11.2.112 The Rehabilitation Schedule sets out the process for decommissioning. This proposes decommissioning which is largely a reversal of construction and will take place over a period of up to two years. It is assumed the same would apply to other windfarms considered in this cumulative assessment.

12.11.2.113 During the decommissioning phase, direct disturbance and displacement of red-throated divers, gannet, guillemots and razorbills is likely to occur due to the presence of working vessels and crews and the movement and noise associated with these within the Array Area.

MAGNITUDE OF IMPACT

12.11.2.114 Any effects generated from the cumulative impact of disturbance and displacement from increased vessel activity during the decommissioning phase are expected to be similar, or of reduced magnitude, to those generated during the construction phase, as certain activities such as piling would not be required. This is because it would largely involve a reverse of the construction phase through the removal of structures and materials installed. It is anticipated that all structures above the seabed level will be completely removed, with cables and any scour/cable protection to be left in situ. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment.

12.11.2.115 Such activities have already been assessed in the cumulative construction section above and have been found to be of Low or Negligible magnitude.

12.11.2.116 As for the construction phase, the cumulative impact of displacement and disturbance is predicted to be of local spatial extent, short term duration, continuous and high reversibility. It is predicted that the impact will affect seabirds directly. The magnitude is therefore, considered to be Negligible.

SENSITIVITY OF SEABIRDS

12.11.2.117 As for the construction phase, gannets, razorbills, guillemots and red-throated divers are deemed to be of medium to high vulnerability, medium to high recoverability and high value. The sensitivity of the receptors is therefore, considered to be Medium to High.

SIGNIFICANCE OF THE EFFECT

12.11.2.118 The magnitude of the cumulative impact has been assessed as **Negligible** and the sensitivity of seabird species is considered to range between **Medium** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.11.3 Impact 6 – Cumulative Indirect disturbance and displacement resulting from changes to prey species and habitats

Construction phase

ALL TIERS

12.11.3.1 The potential cumulative effects on benthic invertebrates and fish have been assessed in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026). The main fish prey species considered in this EIAR to be important to seabirds include herring, sprat and sandeel (refer to Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)).

12.11.3.2 The conclusions of the cumulative assessments in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) inform this assessment of indirect cumulative effects on ornithological receptors.

MAGNITUDE OF IMPACT

12.11.3.3 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to indirect disturbance and displacement resulting from changes to prey species and habitats. The magnitude is considered to be Negligible for both Project Design Options.

12.11.3.4 Construction activities associated with the Proposed Development, together with that associated with other offshore windfarms in the Irish Sea, may contribute to cumulative indirect disturbance and displacement resulting from changes to prey species and habitats, in the event construction phases of different projects overlap, including decommissioning of ABWP1. Other projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include Codling Wind Park, Dublin Array, North Irish Sea Array and Oriel.

12.11.3.5 The potential for a cumulative effect on these species during construction would only occur if projects within the Cumulative Offshore Ornithology Study Area assessed overlap in their construction activity.

12.11.3.6 As a worst case, it is assumed that the construction schedule of the Proposed Development will overlap with that for other windfarms within the Cumulative Offshore Ornithology Study Area. However, since the likelihood of a significant effect for the Proposed Development alone was determined to be very small, it is assumed that this conclusion also applies cumulatively.

12.11.3.7 The cumulative impact indirect effects of displacement and disturbance caused by construction activities and associated vessel traffic on seabirds is predicted to be of local spatial extent, short term duration, occurring only once but with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small.

12.11.3.8 Therefore, when assessed cumulatively with the projects set out in Table 12.51, the magnitude of cumulative impact is considered to be Negligible for both Project Design Options.

SENSITIVITY OF SEABIRDS

12.11.3.9 With respect to indirect construction disturbance, overall seabirds are considered to be of Low to High sensitivity. This is due to combinations of low to high adaptability and low to high tolerance, predicted rapid recoverability following cessation of the effect and medium to high conservation value since.

SIGNIFICANCE OF THE EFFECT

12.11.3.10 Overall, for the cumulative indirect construction disturbance the magnitude of the impact has been assessed as **Negligible** for both Project Design Options and the sensitivity of seabird species is considered to range between **Low** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

Operational and maintenance phase

ALL TIERS

12.11.3.11 Birds may be indirectly disturbed and displaced during the operational and maintenance phase if there are direct impacts on prey species and the habitats of prey species.

12.11.3.12 During operation, the production of underwater noise (e.g. through the turning of the wind turbines), loss of habitat, EMF and the generation of suspended sediments (e.g. due to scour or maintenance activities) that may alter the behaviour or availability of bird prey species. Underwater noise and EMF may cause fish and mobile invertebrates to avoid the operational area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the operational area and may smother and hide immobile benthic prey. These mechanisms could result in less prey being available within the operational area to foraging seabirds. Changes in fish and invertebrate communities due to the presence of hard substrate (resulting in colonisation by epifauna and provision of novel habitat providing shelter for fish and invertebrates) may also occur, and changes in fishing activity could influence the communities present.

12.11.3.13 Such potential cumulative effects on benthic habitats and fish have been assessed in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026). The main fish prey species considered in this EIAR to be important to seabirds include herring, sprat and sandeel (refer to Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026)).

12.11.3.14 The conclusions of the cumulative assessments in Volume II, Chapter 9: Benthic Subtidal and Intertidal Ecology (Revised March 2026) and Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026) inform this assessment of indirect effects on ornithological receptors.

MAGNITUDE OF IMPACT

12.11.3.15 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to indirect disturbance and displacement resulting from changes to prey species and habitats. The magnitude is considered to be Negligible for both Project Design Options.

12.11.3.16 The presence and maintenance of the Proposed Development, together with the presence and maintenance of other offshore windfarms in the Irish Sea, may contribute to cumulative indirect disturbance and displacement resulting from changes to prey species and habitats, in the event the operational phases of different projects overlap. Other projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include operational projects in English and Welsh jurisdictions of the Irish Sea in addition to ABWP1, Codling Wind Park, Dublin Array, North Irish Sea Array and Oriel (Table 12.46). It is understood that applications for the Codling, Dublin Array, North Irish Sea Array and Oriel projects are being prepared, although the application material is not available at this time. As such, it has not been possible to undertake a fully quantitative CIA for these projects.

12.11.3.17 The conclusion on the potential for indirect effects for the Proposed Development alone was that this would be imperceptible or slight adverse. This conclusion was based on factors such

as the highly localised nature of EMF and the absence of evidence from operational windfarms for indirect effects on seabirds due to prey changes. This is considered to be equally applicable cumulatively.

12.11.3.18 Therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude of cumulative impact is considered to be Negligible for both Project Design Options.

SENSITIVITY OF SEABIRDS

12.11.3.19 As for during construction, seabirds are deemed to be of low to high vulnerability, medium to high recoverability and medium to high value. The sensitivity of the receptor is therefore, considered to be Low to High.

SIGNIFICANCE OF THE EFFECT

12.11.3.20 Overall, for the cumulative indirect operational disturbance the magnitude of the impact has been assessed as **Negligible** for both Project Design Options and the sensitivity of seabird species is considered to range between **Low** to **High**. The effect will, therefore be **Not Significant** in EIA terms.

Decommissioning phase

12.11.3.21 The Rehabilitation Schedule sets out the process for decommissioning. This makes it clear that decommissioning is largely a reversal of construction and will take place over a period of up to two years. It is assumed the same would apply to other windfarms considered in this cumulative assessment.

12.11.3.22 During the decommissioning phase, indirect effects at the Proposed Development alone, such as displacement of seabird prey species, may occur as structures are removed from the Array Area.

12.11.3.23 As a worst case, it is assumed that the decommissioning schedule of the Proposed Development will overlap with that for other windfarms within the Cumulative Offshore Ornithology Study Area. However, since the likelihood of a significant effect for the Proposed Development alone was determined to be very small, it is assumed that this conclusion also applies cumulatively.

MAGNITUDE OF IMPACT

12.11.3.24 As for the construction phase, the cumulative impact of displacement and disturbance is predicted to be of local spatial extent, short term duration, continuous and high reversibility. It is predicted that the impact will affect seabirds indirectly. The magnitude is therefore, considered to be Negligible.

SENSITIVITY OF SEABIRDS

12.11.3.25 As for the construction phase, seabirds are deemed to be of low to high vulnerability, medium to high recoverability and medium to high value. The sensitivity of the receptor is therefore, considered to be Low to High.

SIGNIFICANCE OF THE EFFECT

12.11.3.26 The magnitude of the cumulative impact has been assessed as **Negligible** and the sensitivity of seabird species is considered to range between **Low** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.11.4 Impact 7 – Cumulative collision risk

Operational and Maintenance Phase

TIER 1

12.11.4.1 The Proposed Development, together with other offshore windfarms in the Irish Sea, may contribute to cumulative collision risk, in the event the operational phases of different projects overlap. Seabirds are highly mobile, therefore they can encounter offshore windfarms, and be at risk of collisions, across large areas. Other projects screened into Tier 1 of the assessment within the Cumulative Offshore Ornithology Study Area include proposed projects in the Irish Sea: Codling, Dublin Array, North Irish Sea Array and Oriel. Operational Tier 1 projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include operational projects in English and Welsh jurisdictions of the Irish Sea in addition to Barrow, Burbo Bank, Burbo Bank Extension, Gwynt y Mor, North Hoyle, Ormonde, Rhyl Flats, Robin Rigg, Walney, Walney Extension, West of Duddon Sands, Awel y Mor, Erebus, Twin Hub, Morgan, Morecambe and White Cross (Table 12.50).

TIER 1 + TIER 2

12.11.4.2 The Proposed Development, together with other offshore windfarms in the Irish Sea, may contribute to cumulative collision risk, in the event the operational phases of different projects overlap. Seabirds are highly mobile, therefore they can encounter offshore windfarms, and be at risk of collisions, across large areas. In addition to Tier 1 projects (above) other Tier 2 projects screened into the assessment within the Cumulative Offshore Ornithology Study Area include consented projects in English and Welsh jurisdictions of the Irish Sea: Mona (Table 12.50).

TIER 1 + TIER 2 + TIER 3

12.11.4.3 The Proposed Development, together with other offshore windfarms in the Irish Sea, may contribute to cumulative collision risk, in the event the operational phases of different projects overlap. Seabirds are highly mobile, therefore they can encounter offshore windfarms, and be at risk of collisions, across large areas. Other projects screened into the assessment within the Cumulative Offshore Ornithology Study Area in addition to Tiers 1 and 2 include proposed projects in English and Welsh jurisdictions of the Irish Sea: ABWP1 (decommissioning), Mooir Vannin, Valorous and Llyr 1 (Table 12.50).

12.11.4.4 Collision risks at the Proposed Development alone were assessed for Arctic tern, black-headed gull, common gull, common tern, herring gull, kittiwake and little gull. Other seabird species were either recorded in very low numbers, or have flight characteristics (e.g. fly below rotor height) which put them at very low risk, and therefore were predicted to be at negligible or zero risk of collisions.

12.11.4.5 The species assessed for collision risks vary across projects (i.e. not all species were recorded or assessed at all projects) and estimates are only available for some of the above species for some of the English and Welsh windfarms. Furthermore, no collision estimates could be obtained for the Barrow, Burbo Bank, Gwynt-y-Mor, North Hoyle, Rhyl Flats, Walney and West of Duddon Sands windfarms and only annual total estimates were presented for most other windfarms. Therefore, for more abundant (and hence higher collision risk species) seasonal assessments have been presented where data permit. However for less abundant species (i.e. those with very low annual collision risks) and species with incomplete data, only the annual totals have been assessed.

12.11.4.6 It is considered that all of the windfarms identified for inclusion in the cumulative assessment in Table 12.50 (overview) have the potential to contribute to a cumulative effect.

ARCTIC TERN

MAGNITUDE OF IMPACT

12.11.4.7 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks. The impact magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.4.8 Arctic tern were only assessed for collision risks at three other wind farms: Morecambe, Dublin Array and NISA.

12.11.4.9 The estimated annual total of Arctic terns at risk of collisions from the Proposed Development are 1.8 (Project Design Option 1a), 2.0 (Project Design Option 1b) and 2.0 (Project Design Option 2), which rise to 2.4 to 2.7 individuals when including the Irish and UK projects (Table 12.68).

Table 12.68: Cumulative annual collision risk for Arctic terns using the highest collision predictions for all Project Design Options

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	NISA	0.1	0	0	0.1
1	Oriel	-	-	-	-
1	Codling	-	-	-	-
1	Dublin Array	0.24	0.03	0	0.27
1	Gwynt y Mor	-	-	-	-
1	Rhyl Flats	-	-	-	-
1	Burbo Bank Extension	-	-	-	-
1	North Hoyle	-	-	-	-
1	Walney Extension	-	-	-	-
1	West of Duddon Sands	-	-	-	-
1	Walney	-	-	-	-
1	Burbo Bank	-	-	-	-
1	Ormonde	-	-	-	-
1	Barrow	-	-	-	-
1	Robin Rigg	-	-	-	-
1	Awel-y-Mor	-	-	-	-
1	Twin Hub	-	-	-	-
1	Erebus	-	-	-	-

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	Morgan	-	-	-	-
1	Morecambe	0.35	0.02	-	0.37
2	Mona	-	-	-	-
3	ABWP1	-	-	-	-
3	Mooir Vannin	-	-	-	-
3	Valorous	-	-	-	-
3	Llyr 1	-	-	-	-
	Proposed Development – Project Design Option 1a	1.40	0.04	0.29	1.77
	Proposed Development – Project Design Option 1b	1.58	0.05	0.34	2.02
	Proposed Development – Project Design Option 2	1.62	0.05	0.32	2.03
	Total Ireland and UK	**1.65-1.87**	**0.07-0.08**	**0.29-0.32**	**2.42-2.68**

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.10 At the average baseline mortality rate for Arctic terns of 0.163 (Table 12.14), the number of individuals from the breeding season BDMPS population expected to be at risk of mortality across all seasons is 3,720 (22,822 x 0.163). The addition of up to 1.9 to this increases the mortality rate by 0.05%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.11 The cumulative collision risk for common terns during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Low.

SENSITIVITY OF ARCTIC TERNS

12.11.4.12 With respect to collision risk with WTG during the breeding season, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE ALL SEASONS

12.11.4.13 Overall, for cumulative collision risk with WTG during the breeding season the magnitude has been assessed as **Low** for all Project Design Options and the sensitivity of Arctic terns is

considered to be **Medium**. The effect will, therefore be **Slight Adverse**, which is **Not Significant** in EIA terms.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING AUTUMN MIGRATION

12.11.4.14 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 11,800 (72,393 x 0.163). The addition of 0.08 to this increases the mortality rate by <0.001%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.15 The cumulative collision risk for Arctic terns during autumn migration would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF ARCTIC TERNS

12.11.4.16 With respect to collision risk with WTG during autumn migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE ALL SEASONS

12.11.4.17 Overall, for cumulative collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING SPRING MIGRATION

12.11.4.18 At the average baseline mortality rate for Arctic tern of 0.163 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 11,800 (72,393 x 0.163). The addition of 0.3 to this increases the mortality rate by 0.002%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.19 The cumulative collision risk for arctic terns during spring migration would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF ARCTIC TERNS

12.11.4.20 With respect to collision risk with WTG during spring migration, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE ALL SEASONS

12.11.4.21 Overall, for cumulative collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

ANNUAL

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.11.4.22 At the average baseline mortality rate for Arctic terns of 0.163 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 11,800 (72,393 x 0.163). The addition of up to 2.7 to this increases the mortality rate by 0.02%. The biogeographic population for Arctic terns is 628,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 102,364 (628,000 x 0.163). The addition of up to 2.7 to this increases the mortality rate by 0.003%. Thus, the increase in background mortality is between 0.003% and 0.02%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.23 The cumulative collision risk for arctic terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF ARCTIC TERNS

12.11.4.24 With respect to collision risk with WTG during all seasons, overall Arctic terns are considered to be of Medium sensitivity. This is due to a combination of a low tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE ALL SEASONS

12.11.4.25 Overall, for cumulative collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of Arctic terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

BLACK-HEADED GULL

MAGNITUDE OF IMPACT

12.11.4.26 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks. The impact magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.4.27 Black-headed gull were only assessed for collision risks at three other wind farms: Morecambe, Mona and Dublin Array.

12.11.4.28 The estimated annual cumulative total of black-headed gull at risk of collisions from the Proposed Development are 17.1 (design option 1a), 20.1 (Project Design Option 1b) and 18.9 (Project Design Option 2) , which rise to 18.8 to 21.8 individuals when including the Irish and UK Projects (Table 12.70).

Table 12.69 Cumulative annual collision risk for black-headed gull using the highest collision predictions for all Project Design Options

Tier	Windfarm	Breeding season	Nonbreeding	Annual
1	NISA	-	-	-
1	Oriel	-	-	-
1	Codling	-	-	-
1	Dublin Array	-	0.8	0.8
1	Gwynt y Mor	-	-	-
1	Rhyl Flats	-	-	-
1	Burbo Bank Extension	-	-	-
1	North Hoyle	-	-	-
1	Walney Extension	-	-	0
1	West of Duddon Sands	-	-	-
1	Walney	-	-	-
1	Burbo Bank	-	-	-
1	Ormonde	-	-	-
1	Barrow	-	-	-
1	Robin Rigg	-	-	-
1	Awel-y-Mor	-	-	-
1	Twin Hub	-	-	-
1	Erebus	-	-	-
1	Morgan	-	-	-
1	Morecambe	-	-	0.07
2	Mona	-	-	0.83
3	ABWP1	-	-	-
3	Mooir Vannin	-	-	-
3	Valorous	-	-	-
3	Llyr 1	-	-	-

Tier	Windfarm	Breeding season	Nonbreeding	Annual
	Proposed Development – Project Design Option 1a	0.07	17.0	17.07
	Proposed Development – Project Design Option 1b	0.09	20.0	20.1
	Proposed Development – Project Design Option 2	0.08	18.9	19.0
	Total Ireland and UK	**0.07-0.09**	**17.8-20.8**	**18.8-21.8**

BREEDING SEASON

12.11.4.1 Almost no black-headed gull collisions were predicted in the breeding season (0.1) therefore this level of impact does not require further assessment and is considered to be **Not Significant** in EIA terms.

12.11.4.2 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

ANNUAL

12.11.4.3 Almost all the predicted collisions occurred during the nonbreeding season, therefore the annual assessment also covers the nonbreeding period alone.

12.11.4.4 The biogeographic reference population for black-headed gull is 4,250,000 (Table 12.13). At the average baseline mortality rate for black-headed gulls of 0.175 (Table 12.14), the number of individuals from the biogeographic population expected to be at risk of mortality during the nonbreeding season is 743,750 (4,250,000 x 0.175). The addition of 21.8 to this increases the mortality rate by 0.003%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.5 The collision risk for black-headed gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Therefore, the magnitude is considered to be Negligible.

SENSITIVITY OF BLACK-HEADED GULL

12.11.4.6 With respect to collision risk with WTG during nonbreeding season, overall black-headed gulls are considered to be of Low sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and low conservation value.

SIGNIFICANCE OF THE EFFECT

12.11.4.7 Overall, for the cumulative collision risk across all seasons the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of black-headed gulls is considered to be **Low**. The effect will, therefore, be **Not Significant** in EIA terms.

COMMON GULL

MAGNITUDE OF IMPACT

12.11.4.8 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks. The impact magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.4.9 Common gull were only assessed for collision risks at six other wind farms: Walney Extension, Morecambe, NISA, Oriel, Codling and Dublin Array. Only one other winds farm reported breeding season collisions (Dublin Array) therefore only an annual assessment has been deemed necessary.

12.11.4.10 The estimated annual cumulative total of common gull at risk of collisions from the Proposed Development are 63.6 (design option 1a), 73.7 (Project Design Option 1b) and 71.3 (Project Design Option 2) , which rise to 96.9 to 107.0 individuals when including the Irish and UK Projects (Table 12.70).

Table 12.70 Cumulative annual collision risk for common gull using the highest collision predictions for all Project Design Options

Tier	Windfarm	Breeding season	Nonbreeding	Annual
1	NISA	0	5.4	5.4
1	Oriel	0	10.7	10.7
1	Codling	0	2.3	2.3
1	Dublin Array	0.5	3	3.5
1	Gwynt y Mor	-	-	-
1	Rhyl Flats	-	-	-
1	Burbo Bank Extension	-	-	-
1	North Hoyle	-	-	-
1	Walney Extension	-	-	9
1	West of Duddon Sands	-	-	-
1	Walney	-	-	-
1	Burbo Bank	-	-	-
1	Ormonde	-	-	-
1	Barrow	-	-	-
1	Robin Rigg	-	-	-
1	Awel-y-Mor	-	-	-

Tier	Windfarm	Breeding season	Nonbreeding	Annual
1	Twin Hub	-	-	-
1	Erebus	-	-	-
1	Morgan	-	-	-
1	Morecambe	-	2.4	2.4
2	Mona	-	-	-
3	ABWP1	-	-	-
3	Mooir Vannin	-	-	-
3	Valorous	-	-	-
3	Llyr 1	-	-	-
	Proposed Development – Project Design Option 1a	0.8	62.8	63.6
	Proposed Development – Project Design Option 1b	1.0	72.7	73.7
	Proposed Development – Project Design Option 2	0.9	70.3	71.2
	Total Ireland and UK	**1.3-1.5**	**87.1-97.0**	**96.9-107.0**

12.11.4.11 The biogeographic reference population for common gull is 1,725,000 (Table 12.13). An estimate of 107.0 common gulls were predicted to be at collision risk throughout the year, primarily due to impacts in the nonbreeding season. Common gulls are present throughout the Irish Sea during the nonbreeding period. Jessopp *et al.*, (2018) presented a combined common gull and herring gull estimate (due to the difficulty of separating these species by eye during surveys) of up to 35,000 along the Irish Sea east coast (Jessopp *et al.*, 2018). Large numbers of common gulls migrate from Scandinavia and northern continental Europe to Britain and Ireland during the winter, leading Wright *et al.*, (2012) to estimate the total wintering population (of Britain and Ireland) as 700,000. Although no regional breakdown was provided, this indicates that the population in the Irish Sea in winter is likely to be large, and probably considerably higher than indicated by the number estimated by Jessopp *et al.*, (2018). If the Irish Sea hosts only 15% or more of the wintering population estimate (i.e. 15% of 700,000 = 105,000), which is very likely to be a precautionary value, then the predicted background mortality of the wintering population would be at least 27,090 at an average mortality rate of 0.258 (Table 12.14). The addition of 107 individuals would increase the mortality by less than 0.4%, which would be considered undetectable.

12.11.4.12 The collision risk for common gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high However, since the Irish Sea wintering population is not known with certainty, the magnitude is considered to be Negligible to Low.

12.11.4.13 Therefore, the increase in mortality is not predicted to materially alter the background mortality of the population and would be undetectable. The cumulative impact of collisions is

predicted to be of international spatial extent, long term duration, continuous and high reversibility. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible to Low for all Project Design Options.

SENSITIVITY OF THE COMMON GULL

12.11.4.14 With respect to collision risk with WTG during nonbreeding season, overall common gulls are considered to be of Low sensitivity. This is due to a combination of a high tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT

12.11.4.15 Overall, for the cumulative collision risk across all seasons the magnitude has been assessed as **Negligible** to **Low** for all Project Design Options and the sensitivity of common gulls is considered to be **Low**. The effect will, therefore, be **Slight adverse** which is **not significant** in EIA terms.

COMMON TERN

MAGNITUDE OF IMPACT

12.11.4.16 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks. The impact magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.4.17 The estimated annual cumulative total of common terns at risk of collisions from the Proposed Development are 3. 2 (Project Design Option 1a), 3.6 (Project Design Option 1b) and 3.6 (Project Design Option 2) , which rise to 19.0 to 19.5 individuals when including the Irish and UK projects (Table 12.71).

Table 12.71: Cumulative annual collision risk for common terns using the highest collision predictions for all Project Design Options. Seasonal estimates were not available for most wind farms.

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	NISA	0.7	-	-	0.7
1	Oriel	-	-	-	-
1	Codling	0.02	2.1	0.15	2.3
1	Dublin Array	0.8	1.7	0.5	3.0
1	Gwynt y Mor	-	-	-	-
1	Rhyl Flats	-	-	-	-
1	Burbo Bank Extension	-	-	-	9.0
1	North Hoyle	-	-	-	-
1	Walney Extension	-	-	-	-

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	West of Duddon Sands	-	-	-	-
1	Walney	-	-	-	-
1	Burbo Bank	-	-	-	-
1	Ormonde	-	-	-	-
1	Barrow	-	-	-	-
1	Robin Rigg	-	-	-	-
1	Awel-y-Mor	-	-	-	0.2
1	Twin Hub	-	-	-	-
1	Erebus	-	-	-	-
1	Morgan	-	-	-	-
1	Morecambe	0.05	0.52	-	0.57
1	White Cross	-	-	-	-
2	Mona	-	-	-	-
3	ABWP1	-	-	-	-
3	Mooir Vannin	-	-	-	-
3	Valorous	-	-	-	-
3	Llyr 1	-	-	-	-
	Proposed Development – Project Design Option 1a	2.5	0.4	0.3	3.2
	Proposed Development – Project Design Option 1b	2.9	0.4	0.4	3.7
	Proposed Development – Project Design Option 2	2.8	0.4	0.3	3.5
	Total Ireland and UK	**4.0-4.5**	**4.7-4.7**	**0.95-1.0**	**19.0-19.5**

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.18 At the average baseline mortality rate for common tern of 0.263 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is 6,689 (25,432 x 0.263). The addition of up to 4.5 to this increases the mortality rate by 0.07%. This magnitude of increase

in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.19 The cumulative collision risk for common terns during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF COMMON TERNS

12.11.4.20 With respect to collision risk with WTG during the breeding season, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT

12.11.4.21 Overall, for cumulative collision risk with WTG during the breeding season the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.22 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 19,393 (73,739 x 0.263). The addition of up to 4.7 to this increases the mortality rate by 0.02 This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.23 The cumulative collision risk for common terns during autumn migration would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF COMMON TERNS

12.11.4.24 With respect to collision risk with WTG during autumn migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT

12.11.4.25 Overall, for cumulative collision risk with WTG during autumn migration the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.26 At the average baseline mortality rate for common tern of 0.263 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 19,393 (73,739 x 0.263). The addition of 1.0 to this increases the mortality rate by 0.005%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.27 The cumulative collision risk for common terns during spring migration would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF COMMON TERNS

12.11.4.28 With respect to collision risk with WTG during spring migration, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability to offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE ALL SEASONS

12.11.4.29 Overall, for cumulative collision risk with WTG during spring migration the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

ANNUAL

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.30 At the average baseline mortality rate for common terns of 0.263 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 18,681 (71,030 x 0.263). The addition of up to 19.5 to this increases the mortality rate by 0.10%. The biogeographic population for common terns is 628,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 165,164 (628,000 x 0.263). The addition of up to 19.5 to this increases the mortality rate by 0.01%. Thus, the increase in background mortality is between 0.01% and 0.10%. This magnitude of increase in mortality would not materially alter the background mortality of the population and would be undetectable.

12.11.4.31 The cumulative collision risk for common terns during all seasons would occur throughout the lifetime of the Proposed Development with a high probability but would result in an undetectable effect on the population when considered against background variations. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible for all Project Design Options.

SENSITIVITY OF COMMON TERNS

12.11.4.32 With respect to collision risk with WTG during all seasons, overall common terns are considered to be of Medium sensitivity. This is due to a combination of a medium tolerance and adaptability of offshore windfarms, high recoverability following cessation of the effect and medium conservation value.

SIGNIFICANCE OF THE EFFECT DURING THE ALL SEASONS

12.11.4.33 Overall, for cumulative collision risk with WTG throughout the year the magnitude has been assessed as **Negligible** for all Project Design Options and the sensitivity of common terns is considered to be **Medium**. The effect will, therefore, be **Not Significant** in EIA terms.

HERRING GULL

12.11.4.34 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks. The impact magnitude is considered to be Negligible for both Project Design Options.

12.11.4.35 For most UK wind farms the figures in Table 12.72 were taken from Morecambe Wind Farm (2025). For this project the applicant undertook a retrospective assessment for older wind farms in the Irish Sea for which no quantitative assessment was available in order to derive estimated impact numbers. Therefore these values are not the legally secured ones for these consented and operational wind farms, but instead are precautionary approximations and this should be taken into consideration when reviewing the cumulative outputs.

12.11.4.36 The estimated annual cumulative total of herring gull at risk of collisions from the Proposed Development are 2.6 (Project Design Option 1a), 3.0 (Project Design Option 1b) and 2.8 (Project Design Option 2), which rise to 465.0 to 465.4 individuals when including the Irish and UK projects (Table 12.72).

Table 12.72: Cumulative annual collision risk for herring gulls using the highest collision predictions for all Project Design Options. Note that the values for projects denoted with ' * ' are taken from Morecambe (2025).

Tier	Windfarm	Breeding season	Nonbreeding season	Annual
1	NISA	17.5	39.7	57.2
1	Oriel	26.3	50.8	77.1
1	Codling	25	2.4	27.4
1	Dublin Array	16.1	19.9	36.0
1	Gwynt y Mor *	21	17.3	38.3
1	Rhyl Flats *	5.1	2.4	7.5
1	Burbo Bank Extension *	-	-	12.9
1	North Hoyle	-	-	-
1	Walney Extension *	45.6	28.8	74.4
1	West of Duddon Sands *	31.8	7.1	39.0
1	Walney *	19.2	11.0	31.2
1	Burbo Bank *	1.8	1.5	3.3
1	Ormonde *	-	-	0.4

Tier	Windfarm	Breeding season	Nonbreeding season	Annual
1	Barrow	-	-	-
1	Robin Rigg *	6.8	3.2	10.0
1	Awel-y-Mor *	2	1.5	3.5
1	Twin Hub *	-	-	12.5
1	Erebus *	2.8	1.7	4.5
1	Morgan	2.5	9.1	11.6
1	Morecambe	1.8	2.4	4.2
1	White Cross *	0.3	0	0.3
2	Mona	0.03	1.5	1.5
3	ABWP1	-	-	-
3	Mooir Vannin	1.3	8.3	9.6
3	Valorous	-	-	-
3	Llyr 1	-	-	-
	Proposed Development – Project Design Option 1a	1.9	0.7	2.6
	Proposed Development – Project Design Option 1b	2.2	0.8	3.0
	Proposed Development – Project Design Option 2	2.1	0.7	2.8
	Total Ireland + UK	**228.8-229.1**	**109.3-209.4**	**465.0-465.4**

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.37 An estimate of up to 229.1 herring gulls were predicted to be at cumulative collision risk in the breeding season. The breeding herring gull population was estimated to be between 18,771 and 95,175 (Table 12.11). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is between 3,229 and 16,370. The addition of a maximum of 229.1 to this would increase the mortality rate by between 1.4% and 7.1%.

12.11.4.38 The impact of collision risk with WTG on herring gulls during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability and the magnitude is considered to be Low to Medium.

SENSITIVITY OF HERRING GULLS

12.11.4.39 With respect to collision risk with WTG during breeding season, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance to offshore windfarms with consequent relatively high risk of collisions, medium recoverability following cessation of the effect and medium conservation value since only a small proportion of the herring gulls present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.11.4.40 Overall, for the cumulative collision risk during the breeding season the magnitude has been assessed as **Low to Medium** for all Project Design Options and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Slight to Moderate** at worst which is **not significant** in EIA terms.

MAGNITUDE OF IMPACT DURING THE NONBREEDING SEASON

12.11.4.41 An estimate of up to 209.4 herring gulls were predicted to be at cumulative collision risk in the nonbreeding season. The nonbreeding season population was estimated to be 165,939 (Table 12.12). At the average baseline mortality rate for herring gull of 0.172 (Table 12.14) the natural mortality for this population is 28,541. The addition of a maximum of 209.4 to this would increase the mortality rate by between 0.7% which would be undetectable.

12.11.4.42 The impact of collision risk with WTG on herring gulls during the nonbreeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible to Low.

SENSITIVITY OF HERRING GULL

12.11.4.43 With respect to collision risk with WTG during the nonbreeding season, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a high tolerance of offshore windfarms and a relatively high risk of collision, medium recoverability following cessation of the effect and medium conservation value since, as noted above, only a small proportion of the herring gull present are likely to be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.11.4.44 Overall, for the cumulative collision risk across all seasons the magnitude has been assessed as **Negligible** to **Low** for all Project Design Options and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Slight** at worst which is **not significant** in EIA terms.

MAGNITUDE OF IMPACT DURING ALL SEASONS

12.11.4.45 An estimate of up to 465.4 herring gulls were predicted to be at cumulative collision risk across all seasons combined. At the average baseline mortality rate for herring gull of 0.172 (Table 12.14), the number of individuals from the larger BDMPS population expected to be at risk of mortality across all seasons is 28,541 (165,939 x 0.172). The addition of a maximum of 465.4 to this would increase the mortality rate by 1.6%. The biogeographic population for herring gull is 1,098,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 188,856 (1,098,000 x 0.172). The addition of 465.4 to this increases the mortality rate by 0.25%.

12.11.4.46 The impact of collision risk with WTG on herring gulls during all seasons combined would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Low to Medium.

SENSITIVITY OF HERRING GULLS

12.11.4.47 With respect to collision risk with WTG during all seasons, overall herring gulls are considered to be of Medium sensitivity. This is due to a combination of a low tolerance of offshore windfarms but high adaptability due to their large foraging ranges and varied prey, medium recoverability following cessation of the effect and high conservation value since, as noted above, a proportion of the herring gulls present may be connected to SPA populations.

SIGNIFICANCE OF THE EFFECT

12.11.4.48 Overall, for the cumulative collision risk across all seasons the magnitude has been assessed as **Low** to **Medium** for all Project Design Options and the sensitivity of herring gulls is considered to be **Medium**. The effect will, therefore, be **Slight** to **Moderate** at worst which is **not significant** in EIA terms.

KITTIWAKE

MAGNITUDE OF IMPACT

12.11.4.49 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks. The impact magnitude is considered to be Negligible to Low for both Project Design Options.

12.11.4.50 The estimated annual cumulative total of kittiwakes at risk of collisions from the Proposed Development are 30.3 (design option 1a), 34.5 (design option 1b) and 33.1 (design option 2) , which rise to 594.6 to 597.4 individuals when including the Irish and UK projects (Table 12.73).

Table 12.73: Cumulative annual collision risk for kittiwake using the highest collision predictions for all Project Design Options. Seasonal estimates were not available for most wind farms.

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	NISA	5.4	6.5	7.4	19.3
1	Oriel	4	43.8		47.8
1	Codling	4.2	9.8	4.2	18.2
1	Dublin Array	13.6	10.5	5.5	29.6
1	Gwynt y Mor	-	-	-	-
1	Rhyl Flats	-	-	-	-
1	Burbo Bank Extension	-	-	-	22.3
1	North Hoyle	-	-	-	-

Tier	Windfarm	Breeding season	Autumn migration	Spring migration	Annual
1	Walney Extension	-	-	-	117.0
1	West of Duddon Sands	-	-	-	-
1	Walney	-	-	-	-
1	Burbo Bank	-	-	-	-
1	Ormonde	-	-	-	2.2
1	Barrow	-	-	-	-
1	Robin Rigg	-	-	-	-
1	Awel-y-Mor	-	-	-	34.3
1	Twin Hub	-	-	-	9.5
1	Erebus	-	-	-	58.0
1	Morgan	-	-	-	39.8
1	Morecambe	-	-	-	32.0
1	White Cross	-	-	-	13.7
1	Erebus	-	-	-	36.6
2	Mona	-	-	-	37.1
3	ABWP1	-	-	-	-
3	Mooir Vannin	11.1	16.5	19.3	46.9
3	Valorous	-	-	-	-
3	Llyr 1	-	-	-	23.9
	Proposed Development – Project Design Option 1a	5.0	7.8	17.5	30.3
	Proposed Development – Project Design Option 1b	5.8	8.7	20.1	34.5
	Proposed Development – Project Design Option 2	5.6	8.4	19.1	33.1
	Total Ireland and UK	**43.3-43.9**	**94.9-95.5**	**53.9-55.5**	**618.5-621.3**

BREEDING SEASON

MAGNITUDE OF IMPACT DURING THE BREEDING SEASON

12.11.4.51 An estimate of up to 43.9 kittiwakes were predicted to be at cumulative collision risk during the breeding season. The BDMPS reference population for the breeding season is between 127,721 and 383,507 (Table 12.11). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals expected to be at risk of mortality in the breeding season is between 19,924 and 59,827. The addition of a maximum of 43.9 to this would increase the mortality rate by between 0.07% and 0.22%. Increases in mortality of less than 1% are considered to be undetectable against background variations.

12.11.4.52 The impact of cumulative collision risk with WTG on kittiwakes during the breeding season would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible to Low.

SENSITIVITY OF THE KITTIWAKE

12.11.4.53 A large proportion of the individuals affected are likely to be drawn from SPA populations (as most kittiwake breed at SPA colonies) and therefore kittiwakes are of medium conservation value. Kittiwakes are considered to have a high tolerance and adaptability of offshore windfarms. Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative collision risk during the breeding season, kittwake is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.4.54 Overall, for the cumulative collision risk during the breeding season the magnitude has been assessed as **Negligible** to **Low** for all Project Design Options and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Slight adverse** at worst which is **not significant** in EIA terms.

AUTUMN MIGRATION

MAGNITUDE OF IMPACT DURING AUTUMN MIGRATION

12.11.4.55 An estimate of up to 95.5 kittiwakes were predicted to be at cumulative collision risk during autumn migration. The BDMPS for the autumn migration is 932,957 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the autumn migration is 145,541. The addition of a maximum of 97.6 to this would increase the mortality rate by 0.06%. Increases in mortality of less than 1% are considered to be undetectable against background variations.

12.11.4.56 The impact of cumulative collision risk with WTG on kittiwakes during autumn migration would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible to Low.

SENSITIVITY OF THE KITTIWAKE

12.11.4.57 A large proportion of the individuals affected are likely to be drawn from SPA populations (as most kittiwake breed at SPA colonies) and therefore kittiwakes are of medium conservation value. Kittiwakes are considered to have a high tolerance and adaptability of offshore windfarms. Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative collision risk during autumn migration, kittwake is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.4.58 Overall, for the cumulative collision risk during autumn migration the magnitude has been assessed as **Negligible** to **Low** for all Project Design Options and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Slight adverse** at worst which is **not significant** in EIA terms.

SPRING MIGRATION

MAGNITUDE OF IMPACT DURING SPRING MIGRATION

12.11.4.59 An estimate of up to 55.5 kittiwakes were predicted to be at cumulative collision risk during spring migration. The BDMPS for the spring migration is 712,897 (Table 12.12). At the average baseline mortality rate for kittiwake of 0.156 (Table 12.12), the number of individuals expected to be at risk of mortality in the spring migration is 111,212 (712,897 x 0.156). The addition of a maximum of 55.5 to this would increase the mortality rate by 0.05%. Increases in mortality of less than 1% are considered to be undetectable against background variations.

12.11.4.60 The impact of cumulative collision risk with WTG on kittiwakes during spring migration would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible to Low.

SENSITIVITY OF THE KITTIWAKE

12.11.4.61 A large proportion of the individuals affected are likely to be drawn from SPA populations (as most kittiwake breed at SPA colonies) and therefore kittiwakes are of medium conservation value. Kittiwakes are considered to have a high tolerance and adaptability of offshore windfarms. Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative collision risk during spring migration, kittwake is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

12.11.4.62 Overall, for the cumulative collision risk during spring migration the magnitude has been assessed as **Negligible** to **Low** for all Project Design Options and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Slight adverse** at worst which is **not significant** in EIA terms.

ALL SEASONS COMBINED

MAGNITUDE OF IMPACT DURING ALL SEASONS COMBINED

12.11.4.63 An estimate of up to 621.3 kittiwakes were predicted to be at cumulative collision risk during all seasons combined. At the average baseline mortality rate for kittiwake of 0.156 (Table 12.14), the number of individuals from the largest BDMPS population expected to be at risk of mortality across all seasons is 111,212 (712,897 x 0.156). The addition of 621.3 to this increases the mortality rate by 0.56%. The biogeographic population for kittiwakes is 5,100,000 (Furness, 2015). The number of individuals from the biogeographic population expected to be at risk of mortality across all seasons is 795,600 (5,100,000 x 0.156). The addition of 621.3 to this increases the mortality rate by 0.08%. Increases in mortality of less than 1% are considered to be undetectable against background variations.

12.11.4.64 The impact of cumulative collision risk with WTG on kittiwakes during all seasons combined would occur throughout the lifetime of the Proposed Development with a high probability. However, the increase in mortality associated with this impact is considered to have an undetectable effect on the population, therefore the consequence will be very small. Overall therefore, when assessed cumulatively with the projects set out in Table 12.51 the magnitude is considered to be Negligible to Low.

SENSITIVITY OF THE KITTIWAKE

12.11.4.65 A large proportion of the individuals affected are likely to be drawn from SPA populations (as most kittiwake breed at SPA colonies) and therefore kittiwakes are of medium conservation value. Kittiwakes are considered to have a high tolerance and adaptability of offshore windfarms. Population recovery will be expected to occur in the medium term following cessation of the effect. Therefore, overall, with respect to cumulative collision risk during all seasons combined, kittwake is considered to be of Medium sensitivity.

SIGNIFICANCE OF THE EFFECT

Overall, for the cumulative collision risk during all seasons combined the magnitude has been assessed as **Negligible** to **Low** for all Project Design Options and the sensitivity of kittiwakes is considered to be **Medium**. The effect will, therefore, be **Slight adverse** at worst which is **not significant** in EIA terms.

LITTLE GULL

SIGNIFICANCE OF THE CUMULATIVE EFFECT

12.11.4.66 The Proposed Development alone was predicted to have a Not Significant impact based on both Project Design Options due to collision risks.

No other Irish wind farm assessed little gull collisions, and only two English ones (Morgan and Morecambe) have presented annual collision estimates of 0.6 and 2.9 respectively. These additional impacts would not materially alter the conclusions of the Proposed Development alone assessment. Therefore the cumulative annual collision impact has been assessed as **Low** and the sensitivity of little gulls is considered to be **Low**. The cumulative effect will, therefore, be **Slight adverse** significance, which is **not significant** in EIA terms.

Collison Risk for Migratory waterbirds and terrestrial species

12.11.4.67 The risk of collisions for non-seabird migrants was assessed using the Marine Scotland migratory CRM (mCRM) developed by Hidef Surveying (2024). This work was undertaken collectively on behalf of all the Irish Phase 1 wind farms (Oriel, NISA, Dublin Array, Codling and

ABWP2) and the full report is provided in Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026)). The results for ABWP2 are discussed in section 12.9.9, with the Phase 1 cumulative assessment discussed below.

12.11.4.68 The mCRM tool has built in flight path routes for migrants travelling to and from the UK, but these are only partially appropriate for migration routes to and from Ireland. In recognition of this, the flight-lines in the tool were modified to make them 'Ireland centric' rather than 'UK centric' (see Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026) for details). In combination with appropriate Irish population sizes for the species assessed this ensured the results were robust for assessing the potential collision risk at the Irish Phase 1 projects. For example, this meant that the population estimates used in the modelling were not unrealistically inflated with the inclusion of birds travelling through the Irish Sea to or from UK destinations. These UK bound birds are considered very unlikely to travel through the western Irish Sea where the Phase 1 projects are located, but rather would follow the UK coastline. In this manner the assessment provides precautionary results, since collision risks were not distributed among a larger Irish and UK population, but rather just the Irish one.

12.11.4.69 Among the species included in the mCRM, 70 species were considered for assessment, of which 27 were screened out, leaving 43 to be assessed. Species were screened out if there little or no evidence of connectivity to the western Irish Sea (e.g. for avocet, *Recurvirostra avosetta*) or has been assessed elsewhere (e.g. gannet). Details of these screening determinations are provided in Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026).

12.11.4.70 The outputs from the mCRM summed across all the Phase 1 wind farms are provided in Table 12.74.

Table 12.74: Migratory collision risks at all Phase 1 Projects. Latin names are provided in Volume III, Appendix 12.7: Offshore Ornithology Technical Report - Migrant Non-Seabird Collision Risk Modelling (Revised March 2026)

Species	Annual cumulative collisions	Migratory Irish Population	Percentage of population at risk of collision
Bar-tailed godwit	0.249	16,530	0.0015%
Black-tailed godwit	0.247	19,800	0.0012%
Canadian light-bellied brent goose	0.238	35,150	0.0007%
Corncrake	0.034	436	0.0078%
Common scoter	1.296	7,500	0.0173%
Curlew	0.556	35,240	0.0016%
Dunlin	0.541	45,760	0.0012%
Eider	0.356	5,660	0.0063%
Golden plover	1.156	92,060	0.0013%
Goldeneye	0.843	3,820	0.0221%

Species	Annual cumulative collisions	Migratory Irish Population	Percentage of population at risk of collision
Great crested grebe	0.396	2,930	0.0135%
Great northern diver	0.042	2,240	0.0019%
Greenland white-fronted goose	0.102	9,590	0.0011%
Greenshank	0.020	1,320	0.0015%
Grey plover	0.041	2,940	0.0014%
Hen harrier	0.021	222	0.0095%
Knot	0.193	16,270	0.0012%
Lapwing	1.356	84,690	0.0016%
Long-tailed duck	0.012	38	0.0316%
Mallard	10.453	28,230	0.0370%
Merlin	0.664	4,128	0.0161%
Oystercatcher	0.882	60,540	0.0015%
Pintail	0.327	1,570	0.0208%
Pochard	3.653	11,150	0.0328%
Purple sandpiper	0.008	660	0.0012%
Red-breasted merganser	0.494	2,430	0.0203%
Redshank	0.311	23,800	0.0013%
Red-throated diver	0.016	770	0.0021%
Ringed plover	0.136	11,660	0.0012%
Ruff	0.000	39	0.0000%
Sanderling	0.103	8,420	0.0012%
Scaup	0.453	2,485	0.0182%
Shelduck	1.700	10,160	0.0167%
Short-eared owl	0.620	7,440	0.0083%
Shoveler	0.740	2,240	0.0330%
Slavonian grebe	0.004	42	0.0095%

Species	Annual cumulative collisions	Migratory Irish Population	Percentage of population at risk of collision
Snipe	56.896	3,052,500	0.0019%
Teal	9.640	35,740	0.0270%
Tufted duck	5.186	27,470	0.0189%
Turnstone	0.135	9,480	0.0014%
Whimbrel	0.000	53	0.0000%
Whooper swan	1.683	15,370	0.0109%
Wigeon	11.434	55,730	0.0205%

MAGNITUDE OF IMPACT

12.11.4.71 Only 11 species had cumulative annual collision risks greater than one individual: snipe (56.8), wigeon (11.4), mallard (10.4), teal (9.6), tufted duck (5.2), pochard (3.6), shelduck (1.7), whooper swan (1.7), lapwing (1.3), common scoter (1.3) and golden plover (1.1). The highest number of collisions expressed as a percentage of the migratory population was for mallard, with 0.037% of the population at risk of collision. This equates to a collision risk of one collision in over 2,700 migration movements. The magnitude of cumulative collision risk to migratory species is therefore considered to be Negligible.

MIGRATORY SPECIES SENSITIVITY

12.11.4.72 The species assessed for migratory cumulative collision risks are expected to vary in their sensitivity to collision risk, from low to high, due to different combinations of tolerance and adaptability, recoverability rates following cessation of the effect and low to high conservation values.

SIGNIFICANCE OF THE EFFECT

12.11.4.73 Overall, for cumulative collision risk with WTG in the Irish Phase 1 projects by non-seabird migrants the magnitude has been assessed as **Negligible** and the sensitivity of species varies from **Low** to **High**. The effect will, therefore, be **Not Significant** in EIA terms.

12.11.4.74 No mitigation is proposed for this potential impact, therefore the residual effect remains as stated above.

12.12 Transboundary effects

12.12.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to offshore ornithology receptors from the Proposed Development upon the interests of other states.

12.12.1.2 The potential transboundary impacts assessed within section 12.8 are summarised below:

- Disturbance and displacement (including impacts on species which may have connectivity to UK SPAs) during the construction, operational and maintenance and decommissioning phases. Overall, the effects will be of negligible to moderate adverse significance, which were

considered to be not significant in EIA terms (for example due to very low numbers of impacted individuals and highly precautionary assumptions; see relevant sections for details);

- Indirect disturbance and displacement resulting from changes to prey and habitats (including impacts on species which may have connectivity to UK SPAs) during the construction, operational and maintenance and decommissioning phases. Overall, the effect will be negligible, which are not significant in EIA terms;
- Collision risk (including impacts on species which may have connectivity to UK SPAs) during the construction, operational and maintenance and decommissioning phases. Overall, the effect will be of negligible to slight adverse significance, which are not significant in EIA terms; and
- Barrier effect (including impacts on species which may have connectivity to UK SPAs) during the construction, operational and maintenance and decommissioning phases. Overall, the effect will be of moderate adverse significance at worst, which were considered to be not significant in EIA terms (for example due to very low numbers of impacted individuals and highly precautionary assumptions; see relevant sections for details).

12.13 Summary of effects

12.13.1.1 Information on offshore ornithology within the Offshore Ornithology Study Area was collected through review of available literature, other offshore windfarm assessments, UK statutory guidance, detailed analysis of the data collected during the site-specific aerial surveys and intertidal surveys, and consultation with relevant stakeholders.

12.13.1.2 Table 12.75 and Table 12.76 present a summary of the potential impacts for both Project Design Options, mitigation measures and residual effects in respect to offshore ornithology. The impacts assessed include: disturbance and displacement, indirect disturbance and displacement resulting from changes to prey species and habitats, collision risk, and barrier effect. Overall, it is concluded that there will be no significant effects arising from the Proposed Development during the construction, operational and maintenance or decommissioning phases.

Table 12.75: Summary of potential environmental impacts, mitigation and monitoring for Project Design Option 1 (1a and 1b)

Description of impact	Phase			Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	C	O	D							
Impact 1 – (WTG model 1a/1b) Direct disturbance and displacement	✓	✓	✓	Environmental Vessel Management Plan (see Table 12.21 for details)	C: Negligible to Low O: Negligible to Medium D: Negligible to Low	C: Medium to High O: Medium to High D: Medium to High	C: Not significant to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant to Moderate adverse (not significant in EIA terms)	None	C: Not significant to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant to Moderate adverse (not significant in EIA terms)	Monitoring during the construction phase and for a period of five years post-construction. Collection of distribution data via digital aerial surveys before/after construction.
Impact 2 – (WTG model 1a/1b) Indirect disturbance and displacement resulting from changes to prey species and habitats	✓	✓	✓	Best practice vessel and marine machinery operation (see Table 12.21 for details)	C: Negligible O: Negligible D: Negligible	C: Low to High O: Low to High D: Low to High	C: Not significant O: Not significant D: Not significant	None	C: Not significant O: Not significant D: Not significant	N/A
Impact 3 – (WTG model 1a) Collision risk	×	✓	×	Lower blade tip height of 37m from lowest astronomical tide	O: Negligible to Low	O: Low to Medium	O: Slight to Moderate adverse (not significant in EIA terms)	None	O: Slight to Moderate adverse (not significant in EIA terms)	Collection of data to reduce uncertainties in collision

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
								risk parameters. Note also that the Proposed Development is committed to participating in the 'East Coast Monitoring Group' (ECMG), to discuss and agree potential strategic monitoring initiatives in relation to offshore ornithology. The need for strategic monitoring and the level of participation by individual projects, will be determined by the conclusions
Impact 3 – (WTG model 1b) Collision Risk	× ✓ ×	Lower blade tip height of 37m from lowest astronomical tide	O: Negligible to Low	O: Low to Medium	O: Slight to Moderate adverse (not significant in EIA terms)	None	O: Slight to Moderate adverse (not significant in EIA terms)	

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
								of the EIAR process, in consultation with statutory and technical stakeholders, and with a focus on validation and evidence gathering.
Impact 4 – (WTG model 1a/1b) Barrier Effect	× ✓ ×	N/A	O: Negligible to Low	O: Low to High	O: Slight to Moderate adverse (not significant in EIA terms)	None	O: Slight to Moderate adverse (not significant in EIA terms)	N/A
Impact 5 – (WTG model 1a/1b) Cumulative direct disturbance and displacement	✓ ✓ ✓	Note project alone contribution minimised as per Impact 1	C: Negligible to Low O: Low to Medium D: Negligible	C: High O: Medium D: Medium to High	C: Negligible to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant	None	Negligible to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant	N/A

Description of impact	Phase			Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	C	O	D							
Impact 6 – (WTG model 1a/1b) Cumulative indirect disturbance and displacement	✓	✓	✓	Note project alone contribution minimised as per Impact 2	C: Negligible O: Negligible D: Negligible	C: Low to High O: Low to High D: Low to High	C: Not significant O: Not significant D: Not significant	None	C: Not significant O: Not significant D: Not significant	N/A
Impact 7 – (WTG model 1b) Cumulative collision risk	✗	✓	✗	Lower blade tip height of 37m from lowest astronomical tide (for the Proposed Development)	O: Negligible to Low	O: Low to Medium	O: Not significant to Slight adverse (not significant in EIA terms)	None	O: Not significant to Slight adverse (not significant in EIA terms)	N/A

Table 12.76: Summary of potential environmental impacts, mitigation and monitoring for Project Design Option 2

Description of impact	Phase			Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	C	O	D							
Impact 1 – WTG Model 2 Direct disturbance and displacement	✓	✓	✓	Environmental Vessel Management Plan (see Table 12.21 for details)	C: Negligible to Low O: Negligible to Medium D: Negligible to Low	C: Medium to High O: Medium to High D: Medium to High	C: Not significant to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant to Moderate adverse (not significant in EIA terms)	None	C: Not significant to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant to Moderate adverse (not significant in EIA terms)	Monitoring during the construction phase and for a period of five years post-construction. Collection of distribution data via digital aerial surveys before/after construction.
Impact 2 – WTG Model 2 Indirect disturbance and displacement resulting from changes to prey species and habitats	✓	✓	✓	Best practice vessel and marine machinery operation (see Table 12.21 for details)	C: Negligible O: Negligible D: Negligible	C: Low to High O: Low to High D: Low to High	C: Not significant O: Not significant D: Not significant	None	C: Not significant O: Not significant D: Not significant	N/A
Impact 3 – WTG Model 2 Collision risk	×	✓	×	Lower blade tip height of 37m from lowest astronomical tide	O: Negligible to Low	O: Low to Medium	O: Slight to Moderate adverse (not significant in EIA terms)	None	O: Slight to Moderate adverse (not significant in EIA terms)	Collection of data to reduce uncertainties in collision

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
								risk parameters. Note also that the Proposed Development is committed to participating in the ECMG, to discuss and agree potential strategic monitoring initiatives in relation to offshore ornithology. The need for strategic monitoring and the level of participation by individual projects, will be determined by the conclusions of the EIAR process, in consultation

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
								with statutory and technical stakeholders, and with a focus on validation and evidence gathering.
Impact 4 – WTG Model 2 Barrier Effect	× ✓ ×	N/A	O: Negligible to Low	O: Low to High	O: Slight to Moderate adverse (not significant in EIA terms)	None	O: Slight to Moderate adverse (not significant in EIA terms)	N/A
Impact 5 – WTG Model 2 Cumulative direct disturbance and displacement	✓ ✓ ✓	Note project alone contribution minimised as per Impact 1	C: Negligible to Low O: Low to Medium D: Negligible	C: High O: Medium D: Medium to High	C: Negligible to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant	None	Negligible to Moderate adverse (not significant in EIA terms) O: Slight to Moderate adverse (not significant in EIA terms) D: Not significant	N/A
Impact 6 – WTG Model 2 Cumulative indirect disturbance and displacement	✓ ✓ ✓	Note project alone contribution minimised as per Impact 2	C: Negligible O: Negligible D: Negligible	C: Low to High O: Low to High	C: Not significant O: Not significant	None	C: Not significant O: Not significant	N/A

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
				D: Low to High	D: Not significant		D: Not significant	
Impact 7 – WTG Model 2 Cumulative collision risk	× ✓ ×	Lower blade tip height of 37m from lowest astronomical tide (for the Proposed Development)	O: Negligible to Low	O: Low to Medium	O: Not significant to Slight adverse (not significant in EIA terms)	None	O: Not significant to Slight adverse (not significant in EIA terms)	N/A

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