MachairWind Offshore Windfarm

Chapter 11 Offshore Ornithology

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TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

Technical Appendix 11.1: Overview of Offshore Ornithology EIA and HRA Documents;

Technical Appendix 11.2: Baseline Site Characterisation;

Annex 11.2A: Project DAS Final Report (All Project Surveys);
Annex 11.2B: Third-Party DAS survey 5 (01 plus 04 March 2021);
Annex 11.2C: Third-Party DAS survey 6 (21 March 2021);
Annex 11.2D: Third-Party DAS survey 15 (15 December 2021);
Annex 11.2E: Raw Counts;
Annex 11.2F: Density estimates per survey of birds sat on the water;
Annex 11.2G: Density estimates per survey of birds in flight;
Annex 11.2H: Density estimates per survey of sitting and flying birds;
Annex 11.2I: Abundance estimates per survey of birds sat on the water;
Annex 11.2J: Abundance estimates per survey of birds in flight;
Annex 11.2K: Abundance estimates per survey of sitting and flying birds;
Annex 11.2L: Rarely Recorded Species Information;
Annex 11.2M: Regional Breeding Adult Population Estimates;
Annex 11.2N: Number of birds present in transect segments;
Annex 11.2O: Manx shearwater Tracking Work on Lunga in 2025; and
Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms.

Technical Appendix 11.3: Collision Risk Modelling;

Annex 11.3A: Bootstrapped density inputs to sCRM;
Annex 11.3B: Deterministic CRM inputs and outputs;
Annex 11.3C: Collision Risk Modelling of Greenland white-fronted goose; and
Annex 11.3D: Migratory Collision Risk Modelling;

Technical Appendix 11.4: Displacement;

Technical Appendix 11.5: Cumulative and In-Combination Mortality; and

Technical Appendix 11.7: Population Viability Analysis (PVA).

GLOSSARY OF ACRONYMS

Term	Definition
ALAN	Artificial lighting at night
AOB	Apparently Occupied Burrows
AON	Apparently Occupied Nests
AOS	Apparently Occupied Sites
BDMPS	Biologically Defined Minimum Population Scales
BoCC	Birds of Conservation Concern
CEA	Cumulative Effects Assessment
CEH	Centre for Ecology and Hydrology
CES	Crown Estate Scotland
CIEEM	Chartered Institute of Ecology and Environmental Management
C-PGR	Counterfactual of population growth rate
C-PS	Counterfactual of population size
CRM	Collision Risk Modelling
CV	Coefficient of variation
DAERA	Department of Agriculture, Environment and Rural Affairs
DAS	Digital Aerial Survey(s)
ECC	Export Cable Corridor
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electro-magnetic Field
EMP	Environmental Management Plan
ESAS	European Seabirds at Sea
ETG	Expert Topic Group
EU	European Union
GPS	Global Positioning System
GW	Gigawatt
HAT	Highest Astronomical Tide
HND	Holistic Network Design
HPAI	Highly Pathogenic Avian Influenza
HRA	Habitats Regulations Appraisal

Term	Definition
IND	Individual breeding adult seabird (distinct from pairs, etc.)
INTOG	Innovation and Targeted Oil and Gas
IOF	Important Ornithological Features
IPR	Iterative Plan Review
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LCI	Lower confidence interval
mCRM	Migratory Collision Risk Model
MD-LOT	Marine Directorate – Licensing Operations Team
MGN	Marine Guidance Note
MLS	Most Likely Scenario
MM	Mean-Maximum
MMMP	Marine Mammal Mitigation Protocol
MPCP	Marine Pollution Contingency Plan
MSP	Mean Seasonal Peak
NCMPA	Nature Conservation Marine Protected Area
NE	Natural England
nm	Nautical miles
NPF	National Planning Framework
NTS	National Trust for Scotland
O&M	Operation and Maintenance
OnTDA	Onshore Transmission Development Area
OSP	Offshore Substation Platforms
OWE	Offshore Wind Energy
PO	Plan Options
ProcBe	Procellariiform Behaviour and Demographics
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SAR	Search and Rescue
SCR	Seabird Colony Register
sCRM	Stochastic collision risk modelling
SD	Standard Deviation

Term	Definition
SMP	Seabird Monitoring Programme
SMP-OWE	Sectoral Marine Plan – Offshore Wind Energy
SNCB	Statutory Nature Conservation Bodies
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
TTS	Temporary Threshold Shift
UCI	Upper confidence interval
UK	United Kingdom
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WCS	Worst-case scenario
WDA	Windfarm Development Area
WTG	Wind Turbine Generator
ZoI	Zone of Influence

GLOSSARY OF TERMS

Term	Definition
Bedload	Sediment particles that travel near or on the seabed.
Breeding season	Furness (2015) defines breeding season as the period from modal return to the colony through to modal departure from the colony at the end of breeding, for birds at UK colonies.
Cable protection	Protective measure to minimise the effects of scour and hazards along the offshore cables (e.g. to prevent cable exposure or snagging of vessel anchors or fishing gear), as well as for protecting these cables at infrastructure crossing points.
Climate Change Impact	Climate Change Impact is defined as an impact from a climate hazard, such as asset damage or failure, which affects the ability of the receptor to maintain its function or purpose.
Climate Hazard	Climate Hazard is defined as a weather or climate-related event or trend in climate variable, such as storms or heatwaves, which has potential to do harm to receptors.
Climate Variable	Climate variable is defined as a measurable, monitorable aspect of the weather or climate such as temperature or wind speed.
Collision	The act or process of two moving objects colliding.
Combined Assessment	A whole-Project assessment considering interactions between the Windfarm Development Area, Offshore Export Cable Corridor and Onshore Transmission Development Area (i.e. considering impact interactions and additive effects to determine if any effects would be materially elevated from those assessed for the Windfarm Development Area-alone assessment). Due to long delays in securing confirmation of the Project's grid connection location, the level of detail available for the Offshore Export Cable Corridor and Onshore Transmission Development Area is limited and therefore the assessment is commensurate with the level of detail available at the time of carrying out the assessment. Within the upcoming Offshore Export Cable Corridor and Onshore Transmission Development Area consent applications, their respective scoping and Environmental Impact Assessment Report / Environmental Report will take account of all likely effects predicted within the WDA EIA and present updated combined assessments using the latest available information covering all aspects of the Project.
Demersal	Living on or near the seabed.
Development Area	Application boundary for consenting purposes which, for the Project, consists of a Windfarm Development Area, Offshore Export Cable Corridor, and Onshore Transmission Development Area. Separate consent and marine licence applications will be submitted for each Development Area where applicable.
Embedded mitigation measure	Mitigation measures, including industry good practice measures, that are directly incorporated into the design for the MachairWind Windfarm Development Area to avoid or reduce environmental effects.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed development over and above the existing circumstances (or 'baseline').
Environmental Impact Assessment (EIA) Regulations	A collective term referring to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive as transposed by the Habitats Regulations and comprise Special Areas of Conservation and Special Protection Areas. In accordance with Scottish Government and UK Government policy, candidate SACs, potential SPAs and Ramsar sites are also afforded equivalent protection for assessment purposes, despite not being formally designated European sites.

Term	Definition
Fish Stock	Any natural population of fish made up of an isolated and self-perpetuating group of the same species.
Fleet	A physical group of vessels sharing similar characteristics (e.g., nationality).
Greenhouse gas	A greenhouse gas is a gas that traps heat in the atmosphere and causes the greenhouse effect, also known by the collective shorthand “carbon”.
Habitats Regulations	A collective term used to describe the Conservation of Habitats and Species Regulations 2017 and The Conservation (Natural Habitats, &c.) Regulations 1994.
Highest astronomical tide (HAT)	The highest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions.
Inter-array cables (IACs)	Armoured cable containing electrical and fibre optic cores which link the wind turbine generators to each other and to the offshore substation platform(s).
Landfall	The area from Mean Low Water Springs to a transition bay(s), where the offshore export cable(s) come ashore.
Landings	Quantitative description of the amount of fish returned to port for sale, in terms of value or weight.
MachairWind Offshore Windfarm	An offshore windfarm capable of exporting around 2 GW of renewable energy to the National Electricity Transmission System. MachairWind Offshore Windfarm comprises three Development Areas: • The WDA – located on the west coast of Scotland to the northwest of Islay and west of Colonsay; • The Offshore Export Cable Corridor – a preliminary boundary extending from the WDA to mean high water springs at a landfall location near Girvan, South Ayrshire; and • The Onshore Transmission Development Area – a preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. Separate consent and licence applications will be submitted for each Development Area.
Mean High Water Springs (MHWS)	The average, over a year, of the heights of two successive high waters during those periods of 24 hours (once every fortnight) when the range of the tide is greatest.
Mean Low Water Springs (MLWS)	The average, over a year, of the heights of two successive low waters during those periods of 24 hours (once every fortnight) when the range of the tide is greatest.
National Electricity Transmission System	The high-voltage electricity power transmission network serving Great Britain which receives electricity from generators (such as offshore windfarms) and transmits that electricity to anywhere on the National Electricity Transmission System to satisfy demand.
Non-breeding season	Furness (2015) defines non-breeding season as the remaining part of the year that is not a part of breeding season.
Offshore cables	The collective term for all offshore cables i.e. IACs, offshore substation platform link cables, offshore export cables and associated fibre optic cables.
Offshore export cable	Armoured cable containing electrical cores between the offshore substation platform(s) and landfall. Offshore export cables will include bundled fibre optic cables. The offshore export cables are subject to Marine Licence applications under the Marine (Scotland) Act 2010. The portion of the offshore export cable(s) located within the WDA is assessed as part of this MachairWind WDA EIA and a marine licence application to construct, alter or improve this portion has been submitted alongside the WDA application. A separate marine licence

Term	Definition
	application will be submitted for the portion of the offshore export cable(s) from the WDA boundary to Mean High Water Springs.
Offshore Export Cable Corridor (ECC)	The preliminary boundary extending from the WDA to mean high water springs near Girvan, South Ayrshire and within which the offshore export cable(s) will be located. A separate marine licence application will be submitted for the offshore export cable(s) located within the Offshore ECC.
Offshore Export Cable Corridor infrastructure	The offshore transmission infrastructure located within the boundary of the Offshore Export Cable Corridor, namely the offshore export cable(s).
Offshore Substation Platform (OSP)	An offshore platform with a fixed foundation located within the WDA which houses electrical equipment such as transformers, switchgear, protection and control systems, and enables the windfarm's renewable electricity to be collected via inter-array cables and exported to the National Electricity Transmission System via offshore export cables.
Offshore Substation Platform (OSP) link cables	Electrical cables which link OSPs (if more than one OSP is required). These cables will include fibre optic cores or bundled fibre optic cables. OSP link cables will be wholly located within the WDA.
Onshore Transmission Development Area (OnTDA)	The preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. This Transmission Owner is responsible for consenting the high voltage direct current switching station. Onward connections to the National Electricity Transmission System will be consented by National Grid Electricity Transmission and ScottishPower Transmission. Where relevant, these are considered as part of cumulative effects assessment in the EIA.
OnTDA infrastructure	The onshore transmission infrastructure, for which the Applicant is responsible, that is located primarily within the OnTDA, up to mean low water springs, and includes but is not limited to: landfall(s), onshore export cables, transition joint bays, telecom/SCADA infrastructure including vehicular access, joint bays, link boxes and temporary construction compounds. The OnTDA infrastructure will be subject to a planning application under the Town and Country Planning (Scotland) Act 1997.
Operational life	The operational life is the expected length of time from final commissioning of the WDA until the cessation of commercial operations. This is anticipated to be 35 years.
Option Agreement Area (OAA)	The seabed area awarded to ScottishPower Renewables in January 2022 through the ScotWind leasing round.
OSPAR	OSPAR started in 1972 with the Oslo Convention against dumping and was broadened to cover land-based sources of marine pollution and the offshore industry by the Paris Convention of 1974. These two conventions were unified, updated and extended by the 1992 OSPAR Convention. OSPAR is so named because of the original Oslo and Paris Conventions ("OS" for Oslo and "PAR" for Paris).
Pelagic	Of or relating to the open sea.
Safety zones	An area of water around or adjacent to a wind turbine generator or Offshore Substation Platform and associated substructure which is to be constructed, extended, operated or decommissioned, from which certain or all classes of vessels are excluded and within which activities can be regulated for the purpose of securing safety of the wind turbine generator, substructure or vessels in that vicinity, and individuals on both the wind turbine generator, substructure or vessel, in line with Section 95 of the Energy Act 2004.

Term	Definition
Scottish Marine Area	The area of Scotland's territorial sea limit (up to 12 nautical miles from baseline) as defined in the Marine (Scotland) Act 2010.
ScotWind	A Crown Estate Scotland seabed leasing round which enabled developers to propose offshore wind projects and apply for seabed rights to plan and build windfarms in Scottish waters
Scour protection	Protective measures to avoid sediment being eroded away from the base of the wind turbine generator foundations as a result of the flow of water.
The Applicant	The legal entity submitting consent applications for the MachairWind Offshore Windfarm, namely MachairWind Limited.
The Lighthouse	The Dubh Artach lighthouse.
The Project	MachairWind Offshore Windfarm including all its Development Areas and associated infrastructure.
WDA infrastructure	The offshore generation and transmission infrastructure located within the WDA including but not limited to: WTGs, WTG fixed foundations (and associated scour protection), OSP(s), OSP fixed foundations (and associated scour protection), IACs, OSP link and offshore export cable(s) and their associated external cable protection (insofar as these are located within the WDA) and fibre optic cables.
Wind Turbine Generator (WTG)	A wind turbine generator which converts wind energy into electrical energy. Each wind turbine generator is a complex system composed of a high number of components. Typically, the main components include the rotor assembly (composed of three blades and a hub); the nacelle (containing a generator, shaft and gearbox, power electronic converter and transformer); and the tower (containing lifting equipment and the switchgear).
Windfarm Development Area (WDA)	The application boundary within the OAA where consent will be sought for the proposed WDA infrastructure. The WDA infrastructure is subject to Section 36 consent and marine licence applications (generation and transmission) which are being applied for separately from the Offshore ECC infrastructure and OnTDA infrastructure.

11 OFFSHORE ORNITHOLOGY

11.1 INTRODUCTION

1. This chapter presents an assessment of potential impacts and likely significant effects on offshore ornithological features that may arise from the construction, operation and maintenance (O&M), and decommissioning of the MachairWind Windfarm Development Area (WDA) infrastructure.

2. The grid connection location for the Project was confirmed in August 2025 following lengthy delays stemming from the National Electricity System Operator's 2022 Holistic Network Design (HND) process (see **Chapter 1 Introduction** for further information). Consequently, this topic chapter considers the WDA Study Area and existing environment only. Separate consent and marine licence applications will be sought for the Offshore Export Cable Corridor (ECC) and Onshore Transmission Development Area (OnTDA). A combined assessment of the construction, O&M and decommissioning of the WDA activities, Offshore ECC and OnTDA activities (commensurate with the level of detail that is available at the time of carrying out that assessment) is also provided. This approach will ensure a holistic view is undertaken of the entire Project. As noted in **Chapter 1 Introduction**, the assessment of potential effects on all features associated with the Offshore ECC and OnTDA will be presented in individual Environmental Impact Assessment (EIA) Reports (EIARs), which will be submitted separately in accordance with the relevant EIA Regulations.

3. This chapter considers the following WDA infrastructure: Wind Turbine Generators (WTGs), Offshore Substation Platforms (OSP) and associated fixed foundations and scour protection, inter-array cables, OSP link cables, the portion of the offshore export cable located within the WDA and associated cable protection. It also considers the possible vessel routes and associated ports where Project-related movements to and from the WDA may take place.

4. This chapter has been prepared to provide Marine Directorate - Licensing Operations Team (MD-LOT) (administering on behalf of the Scottish Ministers) and stakeholders with sufficient information to determine the likely significant effect(s) of the Project on the receiving environment.

5. This chapter should be read in conjunction with the following related EIAR chapters:

- **Chapter 8 Benthic Ecology** – potential impacts on habitats have the potential to cause indirect impacts such as impacts on distribution, numbers and diversity of prey species that use such habitats;
- **Chapter 9 Fish (Including Basking Shark) and Shellfish** – potential impacts on fish and shellfish ecology receptors have the potential to cause indirect effects (e.g. through changes to prey resources) on offshore ornithology features; and
- **Chapter 12 Commercial Fisheries** – potential impacts on commercial fisheries receptors have the potential to cause indirect effects (e.g. through changes to prey resources) on offshore ornithology features.

6. Key inter-relationships between this chapter and those listed above will be considered where relevant and presented in this chapter.

7. Additional information to support the offshore ornithology assessment includes:

- **Technical Appendix 11.1: Overview of Offshore Ornithology EIA and HRA Documents;**
- **Technical Appendix 11.2: Baseline Site Characterisation;**
  - Annex 11.2A: Project DAS Final Report (All Project Surveys);
  - Annex 11.2B: Third-Party DAS survey 5 (01 plus 04 March 2021);
  - Annex 11.2C: Third-Party DAS survey 6 (21 March 2021);
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  - Annex 11.3D: Migratory Collision Risk Modelling;
- **Technical Appendix 11.4: Displacement;**
- **Technical Appendix 11.5: Cumulative and In-Combination Mortality; and**
- **Technical Appendix 11.7: Population Viability Analysis (PVA).**

8. This chapter was prepared by SLR Consulting Limited.

11.2 LEGISLATION, POLICY AND GUIDANCE

9. The overarching policy and legislation relevant to the EIA is described in **Chapter 2 Policy and Legislative Context**. **Table 11.1** sets out the relevant legislation, policy and guidance that informs the assessment for offshore ornithology.

Table 11.1 Summary of relevant legislation, policy and guidance for offshore ornithology

Relevant Policy or Guidance	Relevance to the Assessment
Legislation	
European Commission Directive 2009/147/EC (codified version of 79/409/EC) on the Conservation of Wild Birds (the 'Birds Directive') (2009)	The Birds Directive provides legal protection for all naturally occurring wild bird species present in the European Union (EU) and their most important habitats. The Birds Directive requires all Member States to protect all wild bird species and protect and restore their habitats. The Birds Directive was implemented in Scotland by the Nature Conservation (Scotland) Act (2004) and the Offshore Regulations (2017). Potentially negative effects on birds protected under the Birds Directive will be included in the EIA.
European Commission Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') (1992)	The Habitats Directive aims to protect over a thousand species, and 230 characteristic habitat types. The overall objective is to ensure that these species and habitat types are maintained, or restored, to a favourable conservation status within the EU. In addition to halting the further decline or disappearance of these species and habitats, the Directive aims to allow them to recover and thrive over the long-term. The Birds Directive was implemented in Scotland by the Nature Conservation (Scotland) Act (2004) and the Offshore Regulations (2017). Potentially negative effects on birds protected under the Birds Directive will be included in the EIA. Following the United Kingdom’s (UK's) exit from the EU, the implementation of the European Habitats Directive and European Birds Directive has changed. Post-Brexit, the UK has its own framework for protecting habitats and wildlife. In summary, the EU directives have been integrated into UK and Scottish law through domestic legislation (see below), and the UK and Scottish governments

Relevant Policy or Guidance	Relevance to the Assessment
	are responsible for further developing policies for habitat and species protection post-Brexit. The changes reflect a shift to a new legal framework while maintaining the objectives of the original EU Directives.
The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)	These Regulations apply on land in Scotland, and to marine licensing in Scottish inshore waters (the area of sea adjacent to Scotland from 0 to 12 nautical miles (nm)). Potentially negative effects on birds protected under the Habitats Regulations will be included in the EIA.
The Conservation of Habitats and Species Regulations (2017)	These Regulations apply to the inshore area (within 12 nm) in respect of section 36 applications. Potentially negative effects on birds protected under the Habitats Regulations will be included in the **Report to Inform Appropriate Assessment (RIAA)** and are considered in the **WDA Habitats Regulations Appraisal (HRA) Screening Report**. It is noted that The Conservation of Habitats and Species (Offshore Wind) (Miscellaneous Amendments) (Scotland) Regulations 2026 amend the compensation provisions in the 2017 regulations, and the Scottish Government is shortly expected to issue statutory guidance to support the implementation of new compensatory measure requirements but at the time of writing, this has not yet been published.
Ramsar Convention on Wetlands of International Importance (1971)	Ramsar Sites are wetlands of international importance that have been designated under the criteria of the Ramsar Convention on Wetlands for containing representative, rare or unique wetland types or for their importance in conserving biological diversity. Potentially negative effects on Ramsar sites will be included in the EIA. UK and Scottish Government policy is to treat Ramsar sites and species in the same manner as Special Protection Areas (SPA) and so will be considered in this way in the EIA.
The Convention on the Conservation of Migratory Species of Wild Animals (the 'Bonn Convention') (1979)	As an environmental treaty under the aegis of the United Nations Environment Programme, the Bonn Convention provides a global platform for the conservation and sustainable use of migratory animals and their habitats. The Bonn Convention brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. Potentially negative effects on migratory species populations will be included in the EIA and **RIAA**.
The Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention') (1979)	The Bern Convention aims to conserve wild flora and fauna and their natural habitats, promote co-operation between states, and give particular attention to endangered and vulnerable species including endangered and vulnerable migratory species. The Convention sets out obligations for the protection of certain plants and animals, including prohibitions on certain methods of killing, capture or exploitation. An ecological network made up of Areas of Special Conservation Interest was established in 1989, becoming Special Areas of Conservation (SAC) or SPA under the Birds and Habitats Directives. Therefore, potentially negative effects on these sites for birds will be included in the EIA and **RIAA**.
The Wildlife and Countryside Act (as amended) (1981)	The Wildlife and Countryside Act 1981 was enacted primarily to implement the Birds Directive and Bern Convention in Great Britain. The Wildlife and Countryside Act provides protection to all birds, with increased protection afforded to those listed under Schedule 1 of the Act. Potentially negative effects on bird species protected by the Wildlife and Countryside Act will be included in the EIA.

Relevant Policy or Guidance	Relevance to the Assessment
Nature Conservation (Scotland) Act (2004)	Under the Nature Conservation (Scotland) Act 2004, all public bodies in Scotland are required to further the conservation of biodiversity when carrying out their responsibilities. Potentially negative effects on birds and their habitats protected by the Act will be included in the EIA.
Marine (Scotland) Act (2010)	The Marine (Scotland) Act provides a framework to help balance competing demands on Scotland's seas. It introduced a duty to protect and enhance the marine environment. Potentially negative effects on birds and their habitats protected by the Act will be included in the EIA.
Policy	
Scotland's National Marine Plan (Scottish Government, 2015)	Scotland's National Marine Plan sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nm. **The key references are:** **GEN 9 Natural heritage**: *Development and use of the marine environment must: (a) Comply with legal requirements for protected areas and protected species…* '
National Planning Framework 4 (Scottish Government, 2023)	The National Planning Framework 4 (NPF4) is part of the Scottish Government Economic Strategy. NPF4 highlights the importance of sustainable development and the need to facilitate adaptation to climate change and lower greenhouse gas emissions. NPF4 creates stronger links between climate change and the biodiversity crisis. NPF4 highlights the need for developments to conserve, restore and enhance biodiversity. **Key references include:** **Policy 3: Biodiversity**– *"…d) Any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design. …'* **Policy 11: Energy** – intent is "*To encourage, promote and facilitate all forms of renewable energy development onshore and offshore*." Project design and mitigation will demonstrate how impacts, including "*ix. biodiversity including impacts on birds*" are addressed.
Scottish Biodiversity Strategy to 2045	The Strategy sets out an ambition for Scotland to be Nature Positive by 2030, and to have restored and regenerated biodiversity across the country by 2045.
Sectoral Marine Plan – Offshore Wind Energy (Scottish Government, 2020)	The Sectoral Marine Plan – Offshore Wind Energy (SMP-OWE) identified 15 Plan Options (POs) around Scotland's marine zone. Within these Options, the Sustainability Appraisal assessed a potential impact of up to 10 Gigawatts (GW). A key part of the Plan implementation included the application of an Iterative Plan Review (IPR) process (identified as a plan-level mitigation measure within the Strategic Environmental Assessment and HRA reports (2019)). This process allowed for new evidence through, for example, scientific research and/or monitoring programmes to be considered and incorporated into the Plan where appropriate. The IPR was reviewed and updated with all ScotWind and Innovation and Targeted Oil & Gas (INTOG) sites and is expected to be published in 2026. The draft Sectoral Marine Plan (2025) produced from the IPR is listed below.
Sectoral Marine Plan – Roadmap of Actions (Scottish Government, 2022)	The Roadmap of Actions was required to address the evidence gaps identified in the Sectoral Marine Plan and its HRA to provide the evidence base to re-

Relevant Policy or Guidance	Relevance to the Assessment
	assess impacts to seabird populations within sites under the highest levels of ornithological constraint as part of the IPR process. Key outcomes included: • Reduced uncertainty over connectivity between plan options and designated features of SPAs in the breeding and non-breeding seasons; • Reduced uncertainty over collision, displacement, and barrier effects in each PO; • Understanding of population-level impacts on the populations concerned; and • Understanding the contribution of marine spatial planning and mitigation to reducing impacts and unlocking plan option potential for offshore windfarms.
Offshore wind energy - draft updated Sectoral Marine Plan 2025: consultation (Scottish Government, 2025)	In August 2025, the Scottish Government consulted on the draft updated Sectoral Marine Plan 2025. The updated Sectoral Marine Plan takes into account the greater level of ambition for offshore wind development in Scottish waters, which at 40 GW, is substantially larger than the 10 GW that the previous Sectoral Marine Plan considered. As a consequence of this greater ambition, the updated plan identified the following areas of key concern and the issues most likely to constrain development from an environmental viewpoint: • The risk of collision and/or displacement for birds; • Navigational risk; and • Potential significant effects on landscapes and seascapes for developments located within 30 km of inhabited shoreline. With respect to impacts on other marine sectors, the key issue likely to present a consenting risk/constraint to development is displacement of fishing activity. The final updated Sectoral Marine Plan is due to be published in summer 2026.
Offshore wind policy statement 2020 update: Scotland's Offshore Wind Ambition (Scottish Government, 2026)	The updated offshore wind policy statement sets out an increased offshore wind ambition for Scotland. The Scottish Government is now resetting its offshore wind policy ambition to up to 40 GW of new offshore wind capacity by 2040, in addition to the already operational or consented capacity (as of August 2025 when the consultation ended).
The Marine Policy Statement (UK Government, 2011)	**The key reference is:** **3.3.24 -** *"Certain bird species may be displaced by offshore wind turbines, which also have the potential to form barriers to migration or present a collision risk for birds."* Assessment of potential impacts from the WDA on offshore ornithology receptors is provided in this chapter.
Argyll and Bute Local Development Plan 2 (Argyll and Bute Council, 2024)	**The key references are:** **Policy 28: Supporting Sustainable Aquatic and Coastal Development states** - *"Proposals for marine and freshwater aquaculture, marine and coastal developments will be supported where it can be demonstrated that there will be no significant adverse effects, directly, indirectly or cumulatively on i) Designated sites, habitats and species for nature conservation, (including Priority Marine Features, wild migratory salmonids, and European Protected Species)."* **Policy 73: Development Impact on Habitats, Species and Biodiversity – "***When considering development proposals Argyll and Bute Council will give full consideration to the legislation, policies and conservation objectives, contained within the following: i) Wildlife and Countryside Act 1981; (and as amended by the Nature Conservation (Scotland) Act 2004); Species listed on Schedules 1, 5, 7, 8, 9 and 14"*

Relevant Policy or Guidance	Relevance to the Assessment
	Policy 74: Development Impact on Sites of International Importance – *"Unless development is directly connected with or necessary to their conservation, proposals likely to have a significantly adverse effect, including cumulative, upon an existing or proposed Special Protection Area, existing or candidate Special Area of Conservation, or Ramsar Site (i.e. European Sites), including development outwith the site, shall require appropriate assessment"*
Guidance	
NatureScot Guidance Note #1 (NatureScot, 2023a, updated 2025)	Guidance to support Offshore Wind Applications: Marine Ornithology– Overview.
NatureScot Guidance Note #2 (NatureScot, 2023b)	Guidance to support Offshore Wind Applications: Advice for Marine Ornithology Baseline Characterisation Surveys and Reporting.
NatureScot Guidance Note #3 (NatureScot, 2023c)	Guidance to support Offshore Wind applications: Marine Birds -Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges.
NatureScot Guidance Note #4 (NatureScot, 2023d)	Guidance to Support Offshore Wind Applications: Ornithology -Determining Connectivity of Marine Birds with Marine Special Protection Areas and Breeding Seabirds from Colony SPAs in the Non-Breeding Season.
NatureScot Guidance Note #5 (NatureScot, 2023e)	Guidance to support Offshore Wind Applications: Recommendations for marine bird population estimates.
NatureScot Guidance Note #6 (NatureScot, 2023f)	Guidance to support Offshore Wind Applications - Marine Ornithology Impact Pathways for Offshore Wind Developments.
NatureScot Guidance Note #7 (NatureScot, 2023g, updated 2025)	Guidance to support Offshore Wind Applications: Marine Ornithology - Advice for assessing collision risk of marine birds.
NatureScot Guidance Note #8 (NatureScot, 2023h)	Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of marine birds.
NatureScot Guidance Note #9 (NatureScot, 2020)	Guidance to support Offshore Wind Applications: Seasonal periods for Birds in the Scottish Marine Environment.
NatureScot Guidance Note #11 (NatureScot, 2023i)	Guidance to support Offshore Wind Applications: Marine Ornithology - Recommendations for Seabird PVA.
Chartered Institute of Ecology and Environmental Management (CIEEM) (2022)	Guidelines For Ecological Impact Assessment in the UK And Ireland: Terrestrial, Freshwater, Coastal and Marine. Updated April 2022.
Furness et al. (2013)	Assessing vulnerability of marine bird populations to offshore windfarms. *Journal of Environmental Management*, 119, 56-66.
Furness (2015)	*Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales*. Natural England Commissioned Reports.

Relevant Policy or Guidance	Relevance to the Assessment
NatureScot (2022)	Reports and presentations from NatureScot "*Bird impact assessment guidance workshop for offshore wind*"[1,2]
Statutory Nature Conservation Bodies (SNCB) (2017; updated 2022a)	Joint SNCBs *Interim Displacement Advice Note*.
SNCB (2022b)	Joint SNCB Interim Advice on the treatment of displacement for Red-throated Diver.
SNCB (2024)	Joint advice note from the SNCBs regarding bird collision risk modelling for offshore wind developments.

11.3 CONSULTATION

10. This offshore ornithology chapter has been informed by engagement with stakeholders, including those listed below:

- Argyll and Bute Council;
- Department of Agriculture, Environment and Rural Affairs (DAERA);
- MD-LOT;
- NatureScot;
- National Trust for Scotland (NTS); and
- Royal Society for the Protection of Birds (RSPB) Scotland, RSPB Argyll, Arran and Ardnamurchan and RSPB Loch Gruinart.

11. As part of the consultation process, the Applicant presented the approach to assessment to stakeholders to offer transparency around the scoping and assessment methodology and rationale, capture stakeholder advice and guidance, and incorporate stakeholder feedback, where appropriate. A summary of the approach to stakeholder communication and consultation is outlined in **Chapter 6 Consultation and Stakeholder Engagement**.

12. The consultation outcomes in relation to offshore ornithology are outlined in **Table 11.2**, which summarises stakeholder feedback, outlines how the Applicant has responded to the feedback received, and details how it has been considered within this chapter.

13. In addition to the engagement outlined in **Table 11.2**, the points of agreement between the Applicant and NatureScot are listed below:

- The proposed approach to characterisation of the baseline environment and agreement on which digital aerial samples to include in the assessment;
- Agreement with the analytical approach and preliminary results presented for the quantitative collision risk and displacement assessment;
- Agreement with bird biometric input parameters into stochastic collision risk modelling;
- Agreement on the approach to calculate Mean Seasonal Peak abundance estimates;
- Agreement that the SeabORD tool was not required to assess displacement impacts;
- Agreement with proposed approach to define adult proportion from stable age structure;
- Agreement on proposed approach to calculate number of guillemot and razorbill adult individuals at breeding colonies;

[1] https://www.webarchive.org.uk/wayback/archive/20221013130442/https://www.nature.scot/doc/bird-impact-assessment-guidance-workshop-offshore-wind-report-and-presentations.
[2] https://www.nature.scot/doc/bird-impact-assessment-guidance-workshop-offshore-wind-report-and-presentations.

- Agreement to present a semi-quantitative assessment of the potential impact of increased collision risk due to artificial light attraction on Manx shearwater and European storm-petrels; and
- Agreement to qualitatively assess potential direct and indirect impacts of Unexploded Ordnance (UXO) and associated underwater noise on seabirds.

14. It should be noted that the Applicant held an introductory call with NTS on 27 March 2026 regarding the principles of options for compensatory measures and with MD-LOT on 06 May 2026 to discuss the Applicant's submission of a **Without Prejudice Derogation Case**.

Table 11.2 Summary of consultation relevant to offshore ornithology

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
Pre-Scoping Opinions (including Scoping Workshop and Expert Topic Groups)				
1.	RSPB Scotland (Islay)	16 November 2022: Meeting (Islay)	The RSPB raised concerns about the MachairWind development on the Islay Geese population. These concerns were related to the migratory path of the geese population and what mitigation measures could be implemented to reduce this risk. The RSPB raised concerns that the digital aerial surveys fail to capture key migration periods for particular species such as migratory geese. The concern is that this will lead to gaps in the ornithology data.	The Applicant has assessed collision risk for the Islay population of Greenland white-fronted goose, including the presentation of PVA results in **Annex 11.3C: Collision Risk Modelling of Greenland white-fronted goose**. In addition, the stochastic Collision Risk Modelling (sCRM) tool was used to assess collision risk for all migratory species. The Migratory Collision Risk Model (mCRM) outputs are presented in **Annex 11.3D: Migratory Collision Risk Modelling**. Collision risk of migratory species is assessed in **Section 11.11.1.8.2**
2.	RSPB Scotland (Islay)	16 November 2022: Meeting (Islay)	The RSPB enquired about what measures could be undertaken to resolve ornithology data gaps. RSPB suggested expanding the digital aerial survey currently being undertaken to include land and boat-based surveys. The earlier data review undertaken by MacArthur Green did not identify any species-specific population data gaps relating to the proposed wind farm area. Evidence gaps identified in the Recommendations and Action Plan report highlighted a paucity of data on the flight heights of Storm Petrels and Manx Shearwaters.	The Applicant has reviewed the potential impact of increased collision risk due to artificial light attraction for Manx shearwater and European storm-petrel in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. **Section 11.11.1.6** (construction) and **Section 11.11.1.10** (operation) provide a semi-quantitative assessment considering the relative importance of the WDA to Manx shearwaters and European storm-petrels in terms of the wider regional population size and spatial distribution of these two species, informed by boat and aerial survey data, as well as tracking data.
3.	NatureScot	14 June 2023: Expert Topic Group (ETG) MS Teams Meeting 1	In relation to NatureScot Guidance Note #2 (Advice for Marine Ornithology Baseline Characterisation Surveys and Reporting), it is acknowledged that the possible co-variates of data analyses include the ‘distance to coast’, however	The Applicant notes that, as agreed by NatureScot, given the complex coastline in the region around the WDA it would likely be very challenging to include the ‘distance to coast’ co-variate in model-based analyses. Note that the use of model based abundance estimation was discussed in the Ornithology Baseline Technical Report that was

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			NatureScot advised that this covariate is not relevant for MachairWind.	shared with NatureScot (09 July 2025) it was not considered appropriate to use model-based data for the Project, so this comment no longer applies to the assessment.
4.	NatureScot	14 June 2023: ETG MS Teams Meeting 1	In relation to potential collision mortality from the Project alone and cumulatively, NatureScot highlighted that the migratory route analysis of terrestrial migratory birds (including swans and geese) is going to be important for MachairWind due to the project being in close proximity to Islay which hosts known migratory species.	The Applicant has completed a screening of theoretical connectivity for terrestrial migratory birds that are features of SPAs (see **WDA HRA Screening Report**) and run the mCRM to quantify risks. The mCRM outputs are presented in **Annex 11.3D: Migratory Collision Risk Modelling** and these results are considered within an EIA context in **Section 11.11.1.8.2**.
5.	NatureScot	14 June 2023: ETG MS Teams Meeting 1	NatureScot queried whether there are similarities in the design of surveys undertaken by the Project and Third-Party data. NatureScot also highlighted that the addition of the third-party data is beneficial and that it would be useful for NatureScot to see both datasets.	The Applicant confirmed the survey methods were very similar and a full description of each has been provided in **Technical Appendix 11.2: Baseline Site Characterisation**. Both surveys were completed by APEM. The Applicant has provided both the Project and the Third-Party data where it used in the assessment.
6.	RSPB Scotland	14 June 2023: ETG MS Teams Meeting 1	The Applicant has collected survey data from the Option Agreement Area (WDA) and a 4 km buffer. It has also obtained data from a third-party. RSPB queried whether a comparison has been undertaken of the species numbers identified in the Project's DAS and Third-Party DAS during the months where they overlap.	The Applicant has undertaken this comparison in the **Offshore Ornithology Baseline Technical Report** and shared the results with stakeholders (09 July 2025), including RSPB, prior to the impact assessment being undertaken.
7.	RSPB Scotland	14 June 2023: ETG MS Teams Meeting 1	In relation to the collating of available seabird colony count data from colonies within the recommended species-specific foraging ranges to inform baseline characterisation and impact assessment, RSPB highlighted that annual seabird counts are being undertaken on Colonsay and Rathlin Island.	The Applicant has consulted the Seabird Monitoring Programme (SMP) database for the most up to date colony count data prior to the impact assessment being undertaken (see **Annex 11.2M: Regional Breeding Adult Population Estimates** for further details).
8.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether the Project DAS on 21 March 2022 could be used as a sample for February 2022, NatureScot advised that the data should	The Applicant has not included the Project Digital Aerial Survey (DAS) data collected on the 21 March 2022 (Project sample 10) in the impact assessment (refer to NatureScot

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			not be used for February, given the date provided (21st) is too late into March.	comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 77).
9.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether the survey on 11 July 2022 could be used as the sample for Collision Risk Modelling (CRM) analysis for June 2022, NatureScot advised that the data point is not appropriate for use for June due to different behaviours between these months.	The Applicant has not included the Project DAS data collected on 11 July 2022 (Project sample 14) in the impact assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 77).
10.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether the survey on the 4th November 2022 can be used as the sample for CRM analysis for October 2022, NatureScot advised that the November 2022 survey is appropriate to use for the month of October since it was undertaken early in the month (4th).	The Applicant has used the 04 November 2022 sample as the October sample in the impact assessment. Data used in the assessment in **Section 11.11** is provided in **Technical Appendix 11.2: Baseline Site Characterisation**.
11.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether there is sufficient time between the surveys on 21st March 2022 and 28th March 2022 to consider these to be independent samples, NatureScot advised that there is a possibility that the two surveys are independent, and the two datasets should be explored to confirm this.	The Applicant compared these data in the **Offshore Ornithology Baseline Technical Report** and agreed not to include the Project DAS data collected on the 21 March 2022 in the impact assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 77).
12.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether NatureScot had any concerns regarding survey 24, which was undertaken across two days (19 and 23 March 2023), NatureScot advised that the gap between the samples is too great for them to be considered together as a single sample.	The Applicant compared these data in the **Offshore Ornithology Baseline Technical Report**, NatureScot agreed that data recorded 19 and 23 March 2023 can be merged to inform the baseline assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 79). Data recorded 19 and 23 March 2023 are used in the assessment in **Section 11.11**.
13.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether the two surveys on the 02 and 14 December 2022 would be considered representative of the season as December 2021	The Applicant compared these data in the **Offshore Ornithology Baseline Technical Report** and agreed to use Third-Party data in December to provide seasonal

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			was missed, NatureScot advised the Applicant to consider using the third-party data to provide seasonal coverage.	coverage (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 74).
14.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding whether the non-breeding season 2021/22 could be considered complete without a December sample, NatureScot advised that the December 2021 third-party data should be reviewed to see if it represented the peak value. NatureScot would have an issue if it was the peak, there would not be an issue if it was not.	The Applicant compared these data in the **Offshore Ornithology Baseline Technical Report** and agreed to use Third-Party data in December 2021 to provide seasonal coverage (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 74). Third-party data recorded 03 December 2021 are used in the assessment in **Section 11.11**.
15.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	In relation to the Applicant's query regarding MRSea being unable to provide a sample within a month (for sCRM) or a complete season (for matrix displacement assessment), and whether design-based results should be used for all months/seasons, or if gaps should be filled with design-based results, NatureScot advised that a model-based approach is most suitable and that although advice is that MRSea should be used where possible, it may be that, because of the data held by the Applicant, other models could be more appropriate.	The Applicant discussed the use of MRSea in the **Offshore Ornithology Baseline Technical Report** that was shared with NatureScot (09 July 2025). It was not considered appropriate to use MRSea for the Project, so this comment no longer applies to the assessment.
16.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	Regarding the Applicant's query relating to the use of MRSea for birds in flight, and whether environmental covariates should be used, and if these should differ between seasons, NatureScot advised that MRSea should be used for birds in flight using environmental co-variates that best explain the variance in the model.	The Applicant discussed the use of MRSea in the **Offshore Ornithology Baseline Technical Report** that was shared with NatureScot (09 July 2025). It was not considered appropriate to use MRSea for the Project, so this comment no longer applies to the assessment.
17.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	Regarding the NatureScot Guidance Note #8 recommendation that a "mean seasonal peak" population estimate is used in the assessment of potential displacement impacts using the "Matrix approach", NatureScot confirmed that the approach to calculation of	The Applicant has calculated mean seasonal peak estimates using the method presented in its hypothetical example to NatureScot and used these in the displacement

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			the "mean seasonal peak" population estimates presented by the Applicant in its hypothetical example had been calculated correctly.	assessment (refer to **Technical Appendix 11.4: Displacement**).
18.	NatureScot	23 January 2024: ETG MS Teams Meeting 2	Regarding the approach to apportioning raw observations from the Project DAS not identified to species level, NatureScot indicated they were content with the Applicant's approach to shearwater species however will provide further feedback in relation to terns and storm petrel species.	The Applicant has assigned all unidentified shearwater species to Manx shearwater. The Applicant has assigned all storm-petrel species to European storm-petrel and assigned unidentified tern species as 'commic' tern since the only terns identified were common and Arctic terns. Birds not identified to species level have been assigned to a species based on the relative proportions of the positively identified species, where possible. The Applicant sought further feedback and to agree on this approach with NatureScot in the Offshore Ornithology Baseline Technical Report (refer to NatureScot comments on Offshore Ornithology Baseline Technical Report, 07 August 2025, comment number 98). The approach to species group apportioning is provided in **Technical Appendix 11.2: Baseline Site Characterisation**.
19.	NatureScot	01 May 2024: Offshore Ornithology Scoping workshop	NatureScot confirmed that the Project's DAS was sufficient to describe the baseline environment in relation to the WDA. However, the March 2023 survey data need to be compared with other months to make sure it is consistent as surveys were split over two separate days.	The Applicant notes that NatureScot have confirmed the Project DAS data is sufficient to describe the baseline environment in relation to the WDA. The Applicant compared the March 2023 data in the **Offshore Ornithology Baseline Technical Report** and it was agreed with NatureScot that these data could be merged (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 79).

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
20.	NatureScot	01 May 2024: Offshore Ornithology Scoping workshop	In relation to the existing data sources to be used to inform baseline characterisation in the EIAR, NatureScot indicated that the RSPB's Storm petrel (*Hydrobates pelagicus*) tagging study on the Treshnish Isles should be included. NatureScot also noted that the Joint Nature Conservation Committee (JNCC) seabird demographic parameters review report is due to be published.	The Applicant has summarised available information from the RSPB tracking of storm petrels, refer to **Technical Appendix 11.2: Baseline Site Characterisation**. The latest demographic parameters available (Horswill & Robinson 2015) have been used in the assessment.
21.	NatureScot	01 May 2024: Offshore Ornithology Scoping workshop	NatureScot confirmed agreement that the impact assessment should be based only on the Project's DAS data, and that Third-Party DAS data should be excluded from the impact assessment (i.e. third-party data should only be used to inform baseline characterisation).	The Applicant agreed with NatureScot which Project DAS data samples together with which Third-Party DAS data samples should be used to inform the baseline site characterization in the **Offshore Ornithology Baseline Technical Report** (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 73 to 81).
22.	NatureScot	01 May 2024: Offshore Ornithology Scoping workshop	Regarding whether NatureScot has any guidance or advice on the assessment of the effects of HPAI in EIA, NatureScot advised that recent counts, by RSPB, from the relevant HPAI affected colonies are taken account of.	The Applicant has consulted the SMP database for the most up to date colony count data prior to the impact assessment being undertaken (see **Annex 11.2M: Regional Breeding Adult Population Estimates**. These recent counts of relevant seabird colonies have been used in the assessment (refer to **Section 11.11**).
23.	NatureScot	01 May 2024: Offshore Ornithology Scoping workshop	NatureScot indicated ScotMER migratory package 3 will be in the public domain soon.	The sCRM tool was used to assess collision risk for migratory species. The mCRM outputs are presented in **Annex 11.3D: Migratory Collision Risk Modelling** and these results are considered in **Section 11.8.9**.
24.	NatureScot	23 May 2024: Offshore Ornithology Scoping Workshop – Letter written feedback	In relation to the question posed in the Scoping Workshop 'Do you agree with the use of 30 samples of aerial bird densities being used in collision risk modelling or should aerial bird densities from incomplete seasons be excluded from the analyses?', NatureScot guidance recommends that full seasons should be used, notably for distributional responses, to ensure that mean peaks are not skewed if the months with peak counts are not surveyed. For CRM this is	Only complete seasons have been included in the assessment of impact. The Applicant compared density data in the **Offshore Ornithology Baseline Technical Report** and it was agreed with NatureScot which datasets could be used to inform the assessment (refer to NatureScot comments on

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			of less concern, however due to the survey period coinciding with high environmental variability as a result of the ongoing HPAI outbreak and other mass mortality events, concerns remain in applying incomplete seasons. If the densities from months in incomplete seasons are significantly different to the same month in other years (i.e. comparing all July densities), or skew the mean density taken forward, then NatureScot would have concerns with these being used. NatureScot advise that this is looked at for the relevant species and months and only include the months where this is not the case.	**Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 73 to 81).
25.	NatureScot	23 May 2024: Offshore Ornithology Scoping Workshop – Letter written feedback.	In relation to the question posed in the Scoping Workshop ‘Do you agree with the scoping out of the 16 migratory species listed?’, NatureScot stated they are largely content with these migratory species being scoped out, with the exception of red-necked phalarope as the WDA is within the migratory flyway. (NatureScot subsequently agreed to red-necked phalarope being screened out when presented with information on the WDA and migration routes – see stakeholder feedback received on 26 July 2024 below).	Following agreement with NatureScot that the WDA is not within the migratory corridor used by red-necked phalarope, this species has been scoped out of the assessment.
26.	NatureScot	23 May 2024: Offshore Ornithology Scoping Workshop – Letter written feedback.	In relation to the question posed in the Scoping Workshop ‘How should non-breeding season impacts using the NatureScot advised species specific non-breeding seasons be applied to the Biologically Defined Minimum Population Scales (BDMPS) season when more than one BDMPS season is available?’, NatureScot stated they have accepted Berwick Bank offshore wind farm’s definitions of seasons (Berwick Bank Offshore EIA - Appendix 11.5 - Ornithology Apportioning Technical Report (incl. Annexes A and B)). NatureScot stated that breeding and non-breeding seasons are identified as follows:	The approach taken has followed advice from NatureScot to adopt the approach taken by the Berwick Bank Offshore EIA. Breeding and non-breeding seasons have been based on NatureScot’s draft updated seasonal definitions provided by NatureScot at the ETG meeting 4 (ETG 4, 02 December 2025).

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			Breeding season: birds are strongly associated with nest site – nesting, egg laying, provisioning young. Non-breeding season: birds are more widely dispersed and not strongly associated with nest site. This period subsumes the ‘breeding site attendance’ periods defined in NatureScot seasonal definitions guidance. Non-breeding season apportioning is dependent on information within BDMPS (Furness 2015). Where Furness (2015) seasons overlap with NS breeding seasons, Furness (2015) seasons should be foreshortened. For some species Furness (2015) identifies a single non-breeding (winter) period, for others there are also autumn and spring migration BDMPS which should be used.	
27.	NatureScot	23 May 2024: Offshore Ornithology Scoping Workshop – Letter written feedback.	In relation to the question posed in the Scoping Workshop ‘Does the proposed approach meet NatureScot’s expectation of how embedded mitigation and mitigation measures should be addressed in the HRA Screening Report?’, NatureScot stated they are content with this approach. NatureScot also noted that to clarify, examples of the intrinsic elements of a proposal which would not be considered a ‘measure’ and could be taken into account in screening would usually be related to design, location, layout or standard conditions. Cases that would need to be considered at appropriate assessment would include measures specifically included in the proposal in order to mitigate potential impacts, such as conditions, caveats, strategies or other restrictions related to European site qualifiers.	Embedded mitigation measures are considered to be those incorporated into the scheme design and not those applied to reduce impacts to any SPA features, should any be necessary.
28.	NatureScot	12 August 2024: Email correspondence	Further to our advice in Guidance Note 11 on requirements for PVA, NatureScot advise that PVAs will be required for all sites and species where the combined breeding and non-breeding season threshold of 0.02 percent point	PVAs have been completed where the WDA-alone impact exceeds a change in adult survival of 0.02% points. Where the predicted in-combination effect exceeds a change in adult survival of 0.02% points and the predicted effect from

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			change for adult annual survival rate is met or exceeded for project alone or in-combination impacts. To provide a pragmatic and proportionate approach, NatureScot advise a PVA of the in-combination effect is not required where the project alone impact is less than 0.2 birds per annum. In this instance a table should be provided that details by site and species what the point change in adult survival rates are and the number of birds impacted per annum.	the WDA-alone is 0.2 birds per annum or fewer, a PVA was not completed.
29.	RSPB Scotland	25 September 2024: MS Teams Meeting	RSPB commented that petrels and shearwaters are being picked up as part of other Scottish offshore wind farm projects (e.g. Spiorad na Mara) and off Shetland and raised the issue of petrels potentially being attracted to lights on the turbines – this may be an issue which RSPB have asked other developers to look into.	The digital aerial surveys conducted for the Project have recorded Manx shearwater and European storm-petrel in in the WDA plus 4 km buffer, details of the number of birds recorded are presented in **Technical Appendix 11.2: Baseline Site Characterisation**. The Applicant has reviewed the potential impact of increased collision risk due to artificial light attraction for Manx shearwater and European storm-petrel in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. The potential impact of light attraction on these two species is semi-quantitatively assessed in **Section 11.11.1.6** and **Section 11.11.1.10**.
30.	RSPB Scotland	25 September 2024: MS Teams Meeting	RSPB raised the potential of noise impacts on seabirds – breaking of waves on structures during bad weather.	Disturbance effects potentially resulting from noise are incorporated into the displacement assessment; for methodology details on the displacement assessment, refer to **Technical Appendix 11.4: Displacement**. **Section 11.11.1.4** assesses displacement impacts, including noise potentially caused by UXO clearance, during the construction phase.
31.	RSPB Scotland	25 September 2024: MS Teams Meeting	RSPB enquired if the Project has considered corncrake and collision risk for light-bellied brent goose	The Applicant has included corncrake and light-bellied brent goose in the stochastic collision risk modelling on migratory species; mCRM outputs are presented in **Annex 11.3D: Migratory Collision Risk Modelling**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				Collision risk of migratory species is assessed in **Section 11.11.1.8.2**.
32.	NatureScot and RSPB Scotland	02 October 2024 - ETG MS Teams Meeting 3	In advance of ETG 3, various documents were circulated including initial CRM results and a CRM technical appendix which detailed the methods and results of modelling to date. The DAS spatial and temporal coverage was revisited. Data analysis has been undertaken for the WDA for collision risk and WDA plus 2 km buffer for the displacement assessment. It was highlighted that: October 2022 survey on 04 November but is considered as an October sample. March 2023 survey split between two dates - which is being excluded from the analyses. Regarding there being no December 2021 survey, NatureScot asked whether the third-party data had been compared? NatureScot requested that as well as providing the dates of surveys can the time of survey be provided so temporal coverage can be investigated? NatureScot also requested that the approach to consideration of DAS, as advised by the NatureScot Scientific advisory committee should be followed.	It was confirmed at ETG 3 that third party data had not been looked at yet. However, the Applicant later compared Project and Third-Party data in the **Offshore Ornithology Baseline Technical Report** and it was agreed with NatureScot which datasets could be used to inform the assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025 comment number 73 to 81). Full details of the DAS data (including flight times) have been provided in the following annexes which are part of the **Technical Appendix 11.2: Baseline Site Characterisation**: **Annex 11.2A: Project DAS Final Report (All Project Surveys)**; **Annex 11.2B: Third-Party DAS survey 5 (01 plus 04 March 2021)**; **Annex 11.2C: Third-Party DAS survey 6 (21 March 2021)**; and, **Annex 11.2D: Third-Party DAS survey 15 (15 December 2021)**.
33.	NatureScot and RSPB Scotland	02 October 2024 - ETG MS Teams Meeting 3	RSPB noted that there are three wind turbine scenarios for the CRM and questioned whether the Applicant favours a particular size.	The stakeholder comment referred to the preliminary CRM presented at the ETG Meeting 3. The assessment of collision risk has been updated with a Most Likely Scenario (MLS) and a Worst Case Scenario (WCS) turbine design parameter for the assessment.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				The Applicant has provided data inputs and outputs for the two collision risk scenarios (MLS and WCS) in **Technical Appendix 11.3: Collision Risk Modelling**. The quantitative collision risk assessment provided in **Section 11.11** is based on the model outputs from the WCS.
34.	NatureScot and RSPB Scotland	02 October 2024 - ETG MS Teams Meeting 3	NatureScot noted that there were numerous Manx shearwater observations and appreciate there is not a standard methodology for assessing this species, with MachairWind not being alone in having this issue for petrels or shearwaters, so worth considering other approaches. There are different data sources that might be useful to inform the assessment - e.g. some of the tracking studies and how birds are behaving around structures. MachairWind should look at what sources are available and what is able to be quantified. Increased collision risk or increased energetic cost are possible impacts on survival. The ProcBe (Procellariiform Behaviour and Demographics) Project is doing some important work, but this is not going to feed into any assessment solution. NatureScot also pointed out the work that Jason Matthiopolous had done on the Rum Manx Shearwater population.	The potential for artificial light impacts on Manx shearwater and European storm-petrel is semi-quantitatively assessed in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting. A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**.
35.	NatureScot and RSPB Scotland	02 October 2024 - ETG MS Teams Meeting 3	NatureScot asked that given the Treshnish Isles has over 10,000 breeding pairs, the DAS could be under-representing the abundance of procellariforms?	Available tracking data have been reviewed to inform the assessment of impacts on procelliforms. In addition, a study was commissioned by wind farm developers in the north and west Scottish offshore region to review information regarding light attraction and lighting requirements (Furness et al., 2026).

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				The review by Furness et al. (2026) on shearwater and storm petrel attraction (presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**) found that the evidence of attraction is strongly linked to intensity of light, particularly to lighthouses, and that light emissions associated with offshore windfarms are unlikely to result in similar impacts. See in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting.
36.	NatureScot and RSPB Scotland	02 October 2024 - ETG MS Teams Meeting 3	NatureScot noted that there were greater numbers of petrels identified in the lease area at higher species level (only a few as Storm petrels) and requested the Project to explain the approach to apportioning identifications to species level within the EIA.	The Applicant has assigned all storm petrel species to European storm petrel, as described in **Section 11.8.4.1.3**. Full details are provided in **Technical Appendix 11.2: Baseline Site Characterisation**.
37.	NatureScot and RSPB Scotland	02 October 2024 - ETG MS Teams Meeting 3	RSPB commented that it was difficult to gauge potential impacts due to the Project given its location on the west coast. We are at critical points / thresholds for SPAs on the east coast but difficult to tell what these numbers are going to look like for SPAs on the west coast. So will need to wait to see a bit more detail in terms of apportioning. NatureScot agreed but indicated that numbers for kittiwake and guillemot are noteworthy and that 2024 had been a poor breeding season.	The Applicant has provided tables in **Technical Appendix 11.6: Apportioning for HRA** showing, for each species, the annual mortality of adult birds apportioned to SPAs. Breeding season mortality was apportioned to all SPAs within foraging range and non-breeding season mortality was apportioned to SPAs within the species specific Western BDMPS.
Scoping Opinion				
38.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	The Scottish Ministers are broadly content with the study areas as described in Section 11.6 of the Scoping Report, however highlight the representation from NatureScot with regards to study area buffers for consideration.	The Applicant has based the assessment of all birds recorded within the WDA plus a 4 km buffer as advised by NatureScot (refer to comment number 38). Refer to **Technical Appendix 11.2: Baseline Site Characterisation** for details of all birds recorded within the WDA plus 4 km buffer.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
39.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	With regards to the baseline information described in Section 11.4 and Section 11.5 of the Scoping Report, the Scottish Ministers are broadly content with the proposed data sources proposed, but highlight the additional data sources recommended by NatureScot and advise that these are included in the EIA Report. The Scottish Ministers direct the Developer to the representation from NatureScot and RSPB Scotland with regards to DAS which highlights the possible presence of cryptic species and nocturnally active species (e.g. shearwaters and petrels), which may not be recorded effectively using standard survey methods. In addition, the Scottish Ministers advise, in line with NatureScot representation, that any gaps in DAS data should be filled prior to any assessments being undertaken. Finally, the Scottish Ministers direct the Developer to NatureScot Scientific Advisory Committee, Offshore Wind Ornithological Impact Assessment - Review of Digital Aerial Survey Methods in this regard, as highlighted in the RSPB Scotland representation, for consideration.	Available tracking data have been reviewed to inform the assessment of impacts on procelliforms (refer to NatureScot comment number 39). In addition, a study was commissioned by wind farm developers in the north and west Scottish offshore region to review information regarding light attraction and lighting requirements (Furness et al., 2026), refer to **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. **Section 11.11.1.6** (construction) and **Section 11.11.1.10** (operation) consider the relative importance of the WDA to Manx shearwaters and European storm-petrels in terms of the wider regional population size and spatial distribution of these two species, informed by boat and aerial survey data, as well as tracking data. Prior to assessment, it was agreed with NatureScot which DAS data should be used in the quantitative collision risk and displacement assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment 73 to 81).
40.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	The Scottish Ministers are broadly content in the proposed approach to the assessment however request that the NatureScot representation regarding availability bias, SeabORD, population viability assessment and Highly Pathogenic Avian Influenza must be fully implemented in the EIA Report. In addition, the Scottish Ministers draw particular attention to the representation from NatureScot with regards to the approach to collision risk modelling, associated guidance notes, and any possible deviations from NatureScot guidance and advise that this must be fully addressed and implemented in the EIA Report.	NatureScot guidance has been followed and applied in the EIAR. It was agreed through consultation at ETG meeting 4 that the SeabORD tool was not required to assess displacement impacts, and instead the matrix approach only was used (refer to NatureScot comments at MachairWind Offshore Ornithology ETG 4: 02 December 2025, comment number 85). A consideration of Highly Pathogenic Avian Influenza (HPAI) in relation to baseline information is presented in **Section 11.8.10.3**

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				NatureScot Guidance Note 7 (version 3 updated April 2025) was used to assess collision risk, for details refer to **Technical Appendix 11.3: Collision Risk Modelling**.
41.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	The Scottish Ministers have reviewed the mitigation measures detailed in Section 10.8 and the mitigation register (appendix A) of the Scoping Report and advise that, where impact pathways have been identified, the full range of mitigation measures and published guidance must be included in the EIA Report along with further information on proposed offshore ornithology monitoring. This view is in line with the NatureScot and Argyll and Bute Council representations. In addition, the Scottish Ministers highlight the representation from NatureScot which considers there to be scope for additional mitigation measures to be identified and advises that a VMP and disorientation by artificial light sources must be considered.	Embedded mitigation measures are presented in **Table 11.13** and it has been assumed for the purposes of assessment that any post-consent plans / programmes would be finalised and have management prescriptions, constraints etc. agreed by relevant parties, based on these being sufficient to avoid any significant effects. Embedded mitigation measures include an Environmental Management Plan (EMP) which describes current good practice for all construction and O&M vessel activities to be adopted in vessel transit corridors to mitigate disturbance of seabirds. Embedded mitigation measures also include an **Outline Lighting and Marking Plan** (**Appendix 12**), which would include measures to reduce impact risk for seabirds.
42.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	The Scottish Ministers are largely content with the approach to the potential cumulative impacts, as outlined in Section 11.10 of the Scoping Report, however advise that the quantitative assessment of cumulative effects should consider any project which has determined estimates of mortality impacts to relevant species and should not be limited to offshore wind farm projects. This is in line with NatureScot representation. In addition, the Scottish Ministers direct the Developer to the representation from NatureScot for a list of projects that should be considered in the CEA, and agreed with MD-LOT prior to a cumulative impact assessment being undertaken.	The cumulative assessment (**Section 11.12**) has included only other offshore windfarms in the determination of cumulative effects, based on likelihood of comparable impacts on Important Ornithological Features (IOFs). The cumulative project list was shared with NatureScot and MD-LOT prior to application.
43.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	Concerning the screening of breeding colonies in the breeding and non-breeding season, the Scottish Ministers highlight the NatureScot representation with regards to the calculation of distances between SPAs and the Proposed	The regional population assessed in the EIA in the breeding and non-breeding season is discussed in **Section 11.8.7** and **Section 11.8.8** respectively.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			Development and request that this must be fully addressed and implemented in the EIA Report. NatureScot advise that similar to guillemot, herring gull are also likely to remain in the vicinity of their breeding colonies throughout the non-breeding season. In addition, the Scottish Ministers advise that herring gull should be assessed through the EIA only and direct the Developer to NatureScot represention for more information in this regard.	For guillemot and herring gull, foraging range information used in the breeding season is applied in the non-breeding season under the assumption that breeding birds of these species spend all year in the broad vicinity of the colonies, refer to **Section 11.8.8**. Herring gull is assessed in **Section 11.11.1.8.1.5.**
44.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	Regarding potential impacts, as outlined in Section 5.7.3 above, NatureScot advise that light attraction and disorientation, particularly with respect to European storm petrel and manx shearwater, should be considered for all stages of the Proposed Development. Similarly, UXO clearance should be scoped in for seabirds, both directly and [in]directly, during the preconstruction/ construction phases. In addition, temporary disturbance and displacement should be included in the assessment.	The Applicant has reviewed the potential impact of increased collision risk due to artificial light attraction for Manx shearwater and European storm-petrel in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms** and has semi-quantitatively assessed the potential impact of increased collision risk due to artificial light attraction for these two species in **Section 11.11.1.6** and **Section 11.11.1.10**. **Section 11.11.1.4** and **Section 11.11.1.7** assess displacement impacts, including noise potentially caused by UXO clearance, during the construction phase.
45.	MD-LOT	22 November 2024. NatureScot letter advice on the EIA Scoping Report	Regarding non-breeding seasonal impacts, the Scottish Ministers highlight the NatureScot representation in relation to attributing impacts of distributional responses, displacement and barrier effects to non-breeding season BDMPS populations and request that impacts should be assessed against the mean seasonal peak abundance estimates for relevant species. The Scottish Ministers direct the Developer to the representation from NatureScot for more information in this regard.	The Applicant has calculated mean seasonal peak abundance estimates and used these in the displacement assessment (refer to **Technical Appendix 11.4: Displacement**). Displacement and barrier impacts in the breeding and non-breeding season are assessed in **Section 11.11.1.7**.
46.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report HRA Screening Report	We have concerns from the information provided within the Scoping Report and pre-application discussions with the Applicant, that our guidance notes are not being followed for the ornithology assessment. Therefore, we request that	NatureScot guidance has been followed and applied in the EIAR.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			where there is any deviation from our guidance, agreement is reached prior to application submission.	NatureScot Guidance Note 7 (version 3 updated April 2025) was used to assess collision risk, for details refer to **Technical Appendix 11.3: Collision Risk Modelling**.
47.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report HRA Screening Report	The proposed study area for ornithology consists of a 4 km buffer around the WDA, which follows our advice given at the time of the DAS survey commencement and thus we are content with this.	The Applicant has based the assessment of all birds recorded within the WDA plus a 4 km buffer. Refer to **Technical Appendix 11.2: Baseline Site Characterisation** for details of all birds recorded within the WDA plus 4 km buffer.
48.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Our understanding is that separate consents will be sought for the Offshore Transmission Development Area (OfTDA) and Onshore Transmission Development Area (OnTDA) in due course. We advise that we expect, at the Section 36 application stage, for both the WDA and OfTDA assessment to be contained within one EIA Report.	A combined assessment of the WDA, Offshore ECC and OnTDA is presented in **Section 11.11.2**.
49.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	We are content that the combination of existing data sources (including the additional sources suggested below) and site-specific surveys should provide adequate information to characterise the baseline environment.	Note that the 'additional sources' referenced refers to existing Third-Party DAS data. See **Technical Appendix 11.2: Baseline Site Characterisation** for details. The Applicant welcomes agreement of the approach to baseline characterisation. The Applicant compared existing data sources (Project DAS data and Third-Party DAS data) in the **Offshore Ornithology Baseline Technical Report** shared with NatureScot 09 July 2025 and it was agreed with NatureScot which DAS data should be used to inform the baseline assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 73 to 81). All details of data sources are provided in **Technical Appendix 11.2: Baseline Site Characterisation**.
50.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping	JNCC are currently undertaking an update to the demographic rates presented in Horswill and Robinson	Demographic rates available within the Natural England (NE) PVA tool (Searle et al., 2019) were used for PVA

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
		Report and HRA Screening Report	(2015). We would recommend this data source is considered in relation to ornithology should it be published within the proposal timescales.	modelling. Arctic tern adult productivity rate and adult survival rate values were from Horswill and Robinson (2015), as these rates for Arctic tern are not available within the NE PVA tool. All data inputs (including demographic rates) and outputs for all PVAs used in the assessment are presented in **Technical Appendix 11.7: PVA** and key PVA results for each species are presented in **Section 11.11**.
51.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	We are currently in the process of updating our Collison Risk Guidance Note #8 [Note #7], which will include updated parameters published in the Joint SNCBs' collision risk note (2024).	NatureScot Guidance Note 7 (version 3 updated April 2025) was used to assess collision risk, for details refer to **Technical Appendix 11.3: Collision Risk Modelling**.
52.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Particular attention should be given to possible presence of cryptic species and nocturnally active species (e.g. shearwaters and petrels), which may not be recorded effectively using standard survey methods. For nocturnally active species, sources giving distributions of seabirds at sea can be used as a general guide to species that are likely to be present, from Stone et al. (1995) and Waggitt et al. (2020) mapping and tracking studies.	The potential for artificial light impacts on Manx shearwater and European storm-petrel is assessed in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting. This summarises recent information collated by Furness et al. (2026) and presented in the **RIAA** and considers underestimations of these species using DAS methods.
53.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	In pre-application meetings with the Applicant, it has been noted that there is a gap in the Project's DAS data for December 2021. We requested that the Applicant explore whether this gap could be filled with information from the third-party DAS data, with any potential implications of this noted. Our understanding from the most recent meeting (held 2 October 2024) is that this has not been undertaken. Therefore, we advise this is undertaken prior to the assessment being carried out.	The Applicant assessed data gaps in the **Offshore Ornithology Baseline Technical Report** which was shared with stakeholders. Prior to assessment, it was agreed with NatureScot which DAS data should be used in the quantitative collision risk and displacement assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 73 to 81). Details of monthly survey data used in the assessment are provided in **Technical Appendix 11.2: Baseline Site Characterisation**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
54.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Following the Scoping Workshop, held in May 2024, we provided written advice (email sent 23 May 2024) regarding the use of 30 samples from site-specific DAS for collision risk modelling. Within this advice, we highlighted concerns around this approach and requested the Applicant consider the potential for any skew of density estimates introduced by including incomplete survey months. We would have expected that a summary of a comparison of density estimates from complete and incomplete months and between survey years be presented within the Scoping Report to help inform our decision making and understand the effects of the alternative approach. If the information we previously requested can be provided, and all parties agree that this does not skew the data, then we may be able to agree with the inclusion of the full 30 samples from the DAS for collision risk modelling. In addition, as noted above, the outstanding question on whether the missing proposal DAS data (December 2021) can be filled using the third-party DAS data should also be addressed.	The Applicant compared density estimates from all Project and Third-Party DAS in the **Offshore Ornithology Baseline Technical Report**. Prior to assessment, it was agreed with NatureScot which DAS data should be used in the quantitative collision risk and displacement assessment (refer to NatureScot comments on **Offshore Ornithology Baseline Technical Report**, 07 August 2025, comment number 73 to 81). Details of monthly survey data used in the assessment are provided in **Technical Appendix 11.2: Baseline Site Characterisation**.
55.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Disturbance and displacement from vessel movements should be assessed during all phases of the proposal (construction, operation and maintenance, and decommissioning) as vessels transiting between ports / harbours and the WDA, may potentially cause disturbance to birds using their preferred foraging areas. This will be of particular importance if the ports used could result in impacts on sea duck and diver qualifying species of SPAs such as the Sound of Gigha SPA. Mitigation measures may help to reduce these disturbance impacts, such as avoidance of key sensitive periods during the annual cycle, agreed transit routes etc.	Impacts associated with vessel movements during the Project’s phases have been assessed in **Section 11.11.1.4.4** (construction) and **Section 11.11.1.7** (O&M). This includes movements between ports and the WDA.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
56.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	If vessels are likely to transit through such locations, we recommend that the assessment process for disturbance includes the following: Information on likely vessel routes, lie-up / sheltering areas, numbers of vessel trips and types of vessels. Information on existing / baseline vessel traffic and the potential increase in traffic due to the proposal. Sensitivity of qualifying species to vessel disturbance. Densities and distribution of sensitive bird species throughout the SPA and consideration of how potential vessel traffic may impact on higher bird densities. Extent of the SPA and qualifying species populations likely to be affected by vessel disturbance. Reference to a Vessel Management Plan and the embedded mitigation measures contained within the plan that are relevant to birds. Consideration of additional mitigation measures relevant to this potential impact.	The determination of ports and vessel routes is at a preliminary stage, however a short list of possible ports and associated vessel routes to the WDA has been considered in the assessment. All available relevant information relating to these has been taken into account in **Section 11.11.1.4.4** (construction) and **Section 11.11.1.7** (O&M) (note that impacts associated with SPAs have been considered in the **RIAA**).
57.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Advise the potential impact of lighting attraction and disorientation should be scoped in for assessment…. We would expect the assessment to be qualitative and note that the impacts of light attraction and disorientation may also be linked to, or further compound, the impacts associated with collision risk and distributional responses – this should also be considered. Deakin et al. (2022) may be helpful in guiding the assessment.	A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. The potential for artificial light impacts on Manx shearwater and European storm-petrel is semi-quantitatively assessed in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting. This summarises recent information collated by Furness et al. (2026) and presented in the **RIAA**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
58.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	UXO clearance presents a risk to seabirds both directly and indirectly during the pre-construction / construction phase. Detonation of UXO may directly risk injury or death to seabirds within the vicinity of the detonation. Therefore, we expect direct impacts of UXO clearance on seabirds to be assessed within the potential impact 'temporary disturbance and displacement'.	UXO clearance has been considered as part of the overall risks of disturbance to seabirds during the construction phase in **Section 11.11.1.4.3** (Disturbance associated with subsea noise).
59.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	UXO clearance also presents an indirect impact to seabirds in relation to underwater noise impacts on prey species. This impact should also be included within the assessment.	UXO clearance has been considered in relation to indirect effects on prey species in **Section 11.11.1.5**.
60.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Dunn et al. (2024) presents new availability bias correction factors for auks and red-throated diver. We are currently reviewing this and will update our guidance shortly if appropriate. Depending on proposal timescales, this may be relevant for this proposal – we will keep the Applicant informed.	NatureScot Guidance Note 2 does not currently specify which availability correction factors to use. The availability bias correction factors used to correct baseline data for the number of auks under the water at the time of the digital aerial surveys were those used from previous offshore windfarm applications including: Thaxter et al., 2013 (for guillemot and razorbill) and Spencer, 2012 (for puffin). Details of availability bias corrections are provided in **Technical Appendix 11.2: Baseline Site Characterisation**.
61.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	We note that the Applicant refers to NatureScot Guidance Note #7 for avoidance rates to use in collision risk modelling until updated guidance becomes available. We are currently in the process of updating our collision risk guidance - this will include an update to the avoidance rates and we will inform the Applicant as soon as this information is available.	NatureScot Guidance Note 7 (version 3 updated April 2025) was used to assess collision risk, for details refer to **Technical Appendix 11.3: Collision Risk Modelling**.
62.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Paragraph 565 refers to the SeabORD tool, which can be applied to assess kittiwake, guillemot, razorbill and puffin. We note that in Appendix I (Paragraph 94), it is stated that this impact will be assessed using the matrix approach only in the EIA. While we note the version available limits the	It was agreed through consultation at ETG meeting 4 that the SeabORD tool was not required to assess displacement impacts, and instead the matrix approach only was used (refer to NatureScot comments at

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			number of colonies that can be assessed, the information provided in the Scoping Report does not set out which colonies this could or could not be used for. We recommend this is considered further for each species, to determine if it is appropriate to use SeabORD to assess impacts at the regional population scale in the EIA. This should be discussed and agreed with us prior to application submission.	MachairWind Offshore Ornithology ETG 4: 02 December 2025). For methodology details on the displacement assessment, refer to **Technical Appendix 11.4: Displacement**.
63.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	It is highlighted in Paragraph 564 that it is unclear how to combine relevant regional population scales (i.e. combining breeding and non-breeding season impacts to create an annual estimate). PVAs only consider the annual consequences of impacts on a population. Therefore, an annual change in baseline survival or mortality rate needs to be presented. Breeding and non-breeding seasons are identified as follows: Breeding season: birds are strongly associated with nest site – nesting, egg laying and provisioning young Non-breeding season: birds are more widely dispersed and not strongly associated with nest site. This period subsumes the 'breeding site attendance' periods defined in our seasonal definition's guidance.	An annual change in baseline survival has been estimated for quantifiable impacts (operational displacement and collision risk), separately (Impacts 4 and 5) and combined, where relevant (Impact 8 – **Section 11.11.1.11**). Details of PVA modelling are presented in **Technical Appendix 11.7: PVA**.
64.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Non-breeding season apportioning is dependent on information within BDMPS (Furness, 2015). Where BDMPS seasons overlap with NatureScot breeding seasons, the BDMPS seasons should be foreshortened. For some species the BDMPS identifies a single non-breeding (winter) period, for others there are also Autumn and Spring migration BDMPS that should be used. For example, for gannet: NatureScot breeding site attendance period in the second half of February and the first half of March becomes part of the non-breeding season. The main breeding season	Species-specific seasonal definitions presented in NatureScot Guidance Note 9 have been applied, these are presented in **Technical Appendix 11.2: Baseline Site Characterisation**. Seasonal definitions used to calculate mean seasonal peak abundance estimates (for displacement assessment) and seasonal collision risk were agreed with NatureScot at ETG meeting 4 (refer to NatureScot comments at MachairWind

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			is as per NatureScot guidance – the second half of March to the end of September. BDMPS for gannet is divided into separate Autmn and Spring migration periods – September-November and December-March. The Spring period is foreshortened to exclude the second half of March to align with NatureScot guidance. There is no migration-free winter period for gannet.	Offshore Ornithology ETG 4: 02 December 2025, comment number 86).
65.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	We advise that there is a need for ongoing engagement in relation to the impacts of HPAI and how to incorporate these impacts within the assessment. Work is continuing within NatureScot to provide further information and guidance, which will be available in due course. In the meantime, we expect the impact of HPAI on colonies to be considered qualitatively, particularly when reviewing PVA outputs.	A consideration of HPAI in relation to baseline information is presented in **Section 11.8.10.3** – see also **Technical Appendix 11.2: Baseline Site Characterisation** for information on baseline surveys and colony counts.
66.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	As the DAS work straddles the timing of the HPAI outbreak it will be important for assessment purposes to consider the current status of seabird populations at SPA colonies. Surveys have been undertaken at a number of key seabird colonies in 2023, co-ordinated by RSPB, some of which were repeated in 2024. Recent data for key species at some sites can be found on the SMP database. In addition, the RSPB have published a report (Tremlett et al., 2024) on HPAI effects, which will provide useful context.	A consideration of HPAI in relation to baseline information is presented in **Section 11.8.10.3** – see also **Technical Appendix 11.2: Offshore Ornithology Baseline Characterisation** for information on baseline surveys and colony counts.
67.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	The quantitative assessment of cumulative effects should consider any project which has determined estimates of mortality impacts to relevant species and should not be limited to offshore wind farm projects. A full list of projects proposed to be considered in the Cumulative Effects Assessment (CEA) should be agreed with MD-LOT and should include (but not limited to) tidal energy, aquaculture and cables, using species-specific foraging ranges to	The cumulative assessment (**Section 11.12**) has included only other offshore windfarms in the determination of cumulative effects, based on likelihood of comparable impacts on IOFs.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			determine connectivity with seabirds most likely to use the WDA.	
68.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	We welcome the identification of embedded mitigation, and a number of measures have been described in Section 11.8 and summarised in Appendix A (Mitigation Register). However, as noted previously, much of the embedded mitigation includes adherence to post-consent plans / programmes. Plans do not strictly constitute mitigation as it is the measures contained within the plans / programmes that will mitigate impacts for which no detail has been provided yet. Furthermore, should significant effects be identified during the EIA, the embedded measures detailed in Section 11.8 may not be sufficient to mitigate impacts.	Embedded mitigation measures are presented in **Table 11.13** and it has been assumed for the purposes of assessment that any post-consent plans / programmes would be finalised and have management prescriptions, constraints etc. agreed by relevant parties, based on these being sufficient to avoid any significant effects.
69.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	At this stage, we consider there to be scope for additional mitigation measures to be identified. Regarding species attracted to and / or disorientated by artificial light sources – as noted above, we recommend considering the findings of Deakin et al. (2022). Additionally, we advise that protocols are built into the construction and operational phases for monitoring and handling of any birds attracted to infrastructure or vessels by lighting, as well as recording of any such incidents.	Embedded mitigation measures presented in **Table 11.13** include an EMP which includes protocols for the construction and O&M phases for monitoring, recording and handling of any birds attracted to vessels and windfarm infrastructure. With these embedded mitigation measures in place, additional mitigation measures are not required, Furness et al. (2026) has reviewed potential artificial light impacts on Manx shearwater and European storm-petrel, refer to **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**.
70.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	We also recommend including a Vessel Management Plan (VMP) covering all phases of the proposal, which includes consideration of disturbance to marine birds. The VMP should consider most likely ports and harbours to be used for vessels transiting to and from the WDA during construction, operation and maintenance, and decommissioning phases. The mitigation measures contained within the VMP may help to reduce these	Embedded mitigation measures are presented in **Table 11.13** and this includes an EMP which describes current good practice for all construction and O&M vessel activities to be adopted in vessel transit corridors to mitigate disturbance of seabirds.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			potential disturbance impacts, for example by avoiding sensitive times of the annual cycle.	
71.	NatureScot	22 November 2024. NatureScot letter advice on the EIA Scoping Report and HRA Screening Report	Further to our EIA scoping advice, provided above. In relation to attributing impacts of distributional responses, displacement and barrier effects to non-breeding season BDMPS populations, impacts should be assessed against the mean seasonal peak abundance estimates for relevant species. The season defined for mean seasonal peak abundance estimates are those as per Furness (2015) BDMPS populations, foreshortened to fall within the NatureScot defined non-breeding season (where these overlap with NatureScot breeding seasons). If this method is followed, the predicted mortalities from these impacts are determined for each BDMPS within the non-breeding season as defined by NatureScot.	The seasonal definitions used for abundance estimates and impact assessment have been agreed through the consultation process – details are presented in **Technical Appendix 11.2: Baseline Site Characterisation**.
72.	RSPB Scotland	26 November 2024: EIA Scoping Opinion, letter correspondence.	European and Leach's Storm Petrel are not included in the screening because of low numbers recorded. As highlighted in Deakin et al. (2022), DAS are likely to have inherent biases in the counts of these species. The first of these biases is related to the small size and consequent detectability of these species, particularly when on the water surface. Furthermore, both species are active throughout the diel cycle, with different levels of activity depending on location and behaviour.	A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. European storm-petrel was screened into the **WDA HRA Screening Report** to assess artificial lighting impacts. Lighting impacts are semi-quantitatively assessed in **Section 11.11.1.6** (Impact 3: Artificial Lighting during Construction) and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting. These sections summarise recent information collated by Furness et al. (2026) which is presented in the **RIAA** and also considers underestimations of this species using DAS methods. All Leach's storm-petrel colonies were beyond this species' foraging range from the WDA and so were screened out of the **WDA HRA Screening Report**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
73.	RSPB Scotland	26 November 2024: EIA Scoping Opinion, letter correspondence.	As well as screening out of European and Leach's Storm Petrel collision impacts on Manx shearwater have been screened out. All these species can be subject to attraction to light (such as those on turbine nacelles) and subsequent disorientation, (Deakin et al. 2022) Such attraction, and subsequent disorientation, could have both direct and indirect impacts on these species. Direct impacts would be collision of birds that have altered their flight trajectory to enter the rotor swept zone, and it is most likely best considered by amended collision risk models. Indirect impacts could be through the energetic consequences of additional flight, which could result in subsequent mortality or reduced breeding performance. RSPB Scotland welcomes ongoing the discussion with the Applicant as to a suitable methodology for this assessment.	A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. The potential for all artificial light impacts on Manx shearwater and European storm-petrel is semi-quantitatively assessed in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting.
Post-Scoping Opinion				
74.	National Trust for Scotland	15 January 2025: Introductory MS Teams Meeting	NTS noted that the low densities of European storm-petrels is concerning, as the population on Treshnish Isles is around 20% of the UK population.	**Technical Appendix 11.2: Baseline Site Characterisation** provides details of all European storm-petrels recorded during digital aerial surveys. The applicant has reviewed the potential impact of increased collision risk due to artificial light attraction for Manx shearwater and European storm-petrel in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. **Section 11.11.1.6** and **Section 11.11.1.10** consider the relative importance of the WDA to Manx shearwaters and European storm-petrels in terms of the wider regional population size and spatial distribution of these two species, informed by boat and aerial survey data, as well as tracking data.
75.	NatureScot	07 August 2025: Letter comments on Offshore	Given the numbers of Manx shearwaters and European storm-petrels recorded throughout the DAS programme and	A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
		Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	given that both species are also active at night, the number of birds present in the WDA may well be higher. NatureScot therefore advises that a semi-quantitative assessment should be undertaken for Manx shearwater and European storm-petrel impacts and suggests that the Project looks at what proportion of the population use the WDA and could be impacted by the proposal in comparison with the wider population in the area.	petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. A semi-quantitative assessment on the potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting.
76.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	NatureScot agrees with the Applicant's proposed approach of sCRM Option 2 to calculate December density estimates using Third-Party DAS sample 15 to fill in the Project DAS data gap in December 2021.	The Applicant welcomes agreement on the proposed approach to use Third-Party DAS sample 15 to fill in the Project DAS data gap in December 2021 (refer to comment number 13 and 14). DAS samples used to calculate density estimates for stochastic collision risk modelling are listed in **Annex 11.3A: Bootstrapped density inputs to sCRM**.
77.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	NatureScot agrees with the Applicant's proposed approach of sCRM Option 2 to calculate February density estimates using Third-Party DAS sample 5 to fill in the Project DAS data gap in February 2021.	The Applicant welcomes agreement on the proposed approach to use Third-Party DAS sample 5 to fill in the Project DAS data gap in February 2021. DAS samples used to calculate density estimates for stochastic collision risk modelling are listed in **Annex 11.3A: Bootstrapped density inputs to sCRM**.
78.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	In relation to the Applicant's proposed approach of Option 3 to calculate the breeding season Mean Seasonal Peak (MSP) for gannet using Third-party DAS sample 6 as a proxy Project sample for March 2021, NatureScot acknowledges that although not ideal, options are limited and is therefore content with the proposed approach.	The Applicant welcomes agreement on the proposed approach to calculate the breeding season MSP for gannet using Third-party DAS sample 6 as a proxy Project sample for March 2021. DAS samples used to calculate mean seasonal peak abundance estimates are listed in **Technical Appendix 11.4: Displacement**.
79.	NatureScot	07 August 2025: Letter comments on Offshore	NatureScot agrees with the Applicant's proposed approach of Option 2 to calculate density estimates from Project DAS	The Applicant welcomes agreement on the proposed approach to use Project DAS samples 11, 15 and 20 and

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
		Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	samples 11, 15 and 20 and to not include Project DAS samples 10, 14 and 21.	not Project DAS samples 10, 14 and 21 (refer to comment numbers 8 and 9). DAS samples used to calculate density estimates for stochastic collision risk modelling are listed in **Annex 11.3A: Bootstrapped density inputs to sCRM**.
80.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	NatureScot agrees with the Applicant's proposed approach of Option 2 to calculate density and abundance estimates from Third-party DAS sample 5 by combining data recorded on the 1st and 4th March 2021.	The Applicant welcomes agreement on the proposed approach to use Third-party DAS sample 5 by combining data recorded on the 01 and 04 March 2021. DAS samples used to calculate density estimates for stochastic collision risk modelling are listed in **Annex 11.3A: Bootstrapped density inputs to sCRM** and those used to calculate mean seasonal peak abundance estimates are listed in **Technical Appendix 11.4: Displacement**.
81.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	NatureScot agrees the Applicant's proposed approach of Option 2 to calculate density and abundance estimates from Project DAS sample 24 by combining data recorded on the 19th and 23rd March 2023; however, it should be clearly noted that the surveys may have missed a peak number of birds between the survey dates. In addition, as the outputs from combining these surveys may be an underestimate, the results from this month's outputs should be interpreted with caution – commentary on this should be included within the EIA.	The Applicant welcomes agreement on the proposed approach to combine data recorded on the 19th and 23 March 2023 for Project DAS sample 24 (refer to comment number 12 and 19). Refer to **Technical Appendix 11.2: Baseline Site Characterisation** for discussion on peak number of birds recorded between 19 and 23 March 2023.
82.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	NatureScot agrees with the Applicant's proposed approach to calculate density estimates from DAS samples listed in Summary Table 2-1 of the Baseline Technical Appendix provided for comment, to be used in the collision risk assessment and abundance estimates from DAS samples listed in Summary Table 2-2 of the Baseline Technical Appendix provided for comment, to be used in the displacement assessment. However, NatureScot highlights	The Applicant welcomes agreement on the list of DAS samples to be included in the collision risk and displacement assessments. NatureScot Guidance Note 7 has been followed. For split months collision impacts are apportioned half to the breeding season and half to the non-breeding season. For

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			that for split months they would expect their guidance to be followed where impacts are apportioned with half to the non-breeding season and half to the breeding season.	details refer to **Technical Appendix 11.3: Collision Risk Modelling**.
83.	NatureScot	07 August 2025: Letter comments on Offshore Ornithology Baseline Technical Appendix and consultation questions regarding approaches.	Generally, NatureScot is content with the Applicant's proposed approach to apportion bird groups listed in Table 3-1 of the Baseline Technical Appendix provided for comment, subject to the following: For gulls apportioning, NatureScot advises that this should be revisited as they feel that it should be possible to apportion the gulls out, particularly the large gull category. The evidence used to assign all storm petrels to European storm petrel should be provided.	The applicant has provided a full explanation of which bird groups were apportioned and the reasons why in **Technical Appendix 11.2: Baseline Site Characterisation**. Species apportioned included gull groups and storm-petrels (refer to comment number 18).
84.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Question 1 Do consultees agree with the Applicant's proposed approach to use R software and not the shiny app tool (Caneco, 2022) to run sCRM and not to run deterministic CRM? We are content with the proposed approach to run the stochastic model using the R package and not the shinyapp tool – we request that you provide us with the code used in R for the audit trail. In relation to the second element of the question – we advise that both the stochastic and deterministic CRM should be run. RSPB also advised at ETG 4 that it is acceptable to use the R code, if the code can be provided.	The sCRM has been run using R Software. See **Technical Appendix 11.3: Collision Risk Modelling** for information on methods of modelling.
85.	NatureScot RSPB Scotland MD-LOT	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4	Q2 Do consultees agree with the Applicant's proposed approach to use the stated bird biometric input parameters into sCRM? Yes, we agree with the proposed input parameters as detailed [in ETG 4 Meeting Presentation].	All details of sCRM inputs and outputs are provided in **Technical Appendix 11.3: Collision Risk Modelling**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
	Argyll and Bute Council	meeting presentation: 18 December 2025		
86.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Q3 Do consultees agree with the Applicant's proposed approach on how to calculate seasonal collision risk mortality? Yes, we are content with the approach laid out [in ETG 4 Meeting Presentation].	Details of how seasonal collision risk mortality has been calculated are provided in **Technical Appendix 11.3: Collision Risk Modelling**.
87.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Q4 Do consultees agree with the Applicant's proposed approach not to use SeabORD in the displacement assessment? Yes, we agree that this is appropriate, the matrix approach can be used to calculate displacement impacts.	All matrix tables to calculate displacement impacts are provided in **Technical Appendix 11.4: Displacement**.
88.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Q5 Do consultees agree with the Applicant's proposed approach to use the stated MSP abundances for displacement assessment? Yes, the approach taken [in ETG 4 Meeting Presentation] is correct. We note that in some cases across species the figures in 2022 were higher than some of those used to calculate MSP, but this is appropriate as our guidance was followed around using 2021 and 2023 data. RSPB indicated conditional agreement at ETG 4, but further detailed review needed.	Details of how MSP abundances were calculated are provided in **Technical Appendix 11.4: Displacement**.
89.	NatureScot RSPB Scotland	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025	Q 6 Do consultees agree with the Applicant's proposed approach to use the stated displacement and mortality rates in the matrices?	Details of displacement and mortality rates used in the matrices to calculate displacement are provided in **Technical Appendix 11.4: Displacement**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
	MD-LOT Argyll and Bute Council	NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Yes, we are content with the inputs stated for kittiwake, guillemot, razorbill, puffin and gannet as they align with our guidance. We also accept the rates proposed for fulmar and the approach of using red-throated diver rates as a proxy for great northern diver. It is noted that for Arctic tern and common tern the rates proposed have been based on those used in previous offshore wind farm applications. We are likely to accept these; however, we request for our records that the offshore wind farm developments used along with the source are provided to us.	
90.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Q 7. Can NatureScot advise that is meant by ‘semi-quantitative’ assessment for Manx shearwater and storm petrel? In our view, a semi-quantitative assessment approach for Manx shearwater and storm petrel is possible. We advise that the proportion of the regional population that currently use the WDA, and thus could be impacted by the proposal, is calculated. This would allow us to understand what proportion of the regional population could be impacted. For example, the DAS results show that 20% if the regional population is using the MachairWind WDA. At ETG 4, RSPB confirmed there is no solution currently. This review proposal was welcomed, although to an extent, the exercise has been carried out before through the Marine Directorate (MD) report and through the Bob Furness report for one of the Dogger Bank projects. Suggest an experimental approach to understanding this would be useful but noted that it’s not necessarily MachairWind’s responsibility. RSPB also stated that it’s likely the review will say there’s potential to be an impact but could be limited in how we take this further. Understanding the legal requirements and engineering challenges of the lighting will be useful in terms	A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. A semi-quantitative assessment on the potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			furthering understanding however may not get us much further than that. The survey data for these species is potentially unreliable due to the nighttime activity of these species and constraints of DAS survey timing. Also, the densities of these species may change once we get the turbines in place with lighting so it's a complex issue. Therefore, it would be good to have a semi-quantitative approach.	
91.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Question 8. Do consultees agree with the Applicant's proposed approach to use the qualitative study on Manx shearwater and storm petrel to qualitatively assess collision risk and displacement for these species? We recommend that the current literature review, which Marine Directorate published on this topic is used alongside the results of the semi-quantitative assessment to give context to how much of an impact the proposal could have on these species. It may be possible to make use of tracking data, if available, to understand how these birds are using the WDA. We are happy to have further discussions around these species if helpful.	A review by Furness et al. (2026) on potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms**. A semi-quantitative assessment on the potential for artificial light impacts on Manx shearwater and European storm-petrel is presented in **Section 11.11.1.6** Impact 3. Artificial Lighting and **Section 11.11.1.10** Impact 7: Artificial Operational Lighting.
92.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4 MS Teams Meeting: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Question 9. Do consultees agree with the Applicant's proposed approach to qualitatively assess potential direct and indirect impacts of UXO and associated underwater noise on seabirds? Yes, we are content with the approach proposed for assessing UXO impacts in relation to seabirds.	The Applicant has considered UXO clearance risks to seabirds during the construction phase in **Section 11.11.1.4**.
93.	NatureScot RSPB Scotland	MachairWind Offshore Ornithology ETG 4: 02 December 2025	Question 10. Do consultees agree with the Applicant's proposed approach to define adult proportion from stable age structure? Yes, we agree with the use of the stable age structure.	The stable age structure was used to define adult proportions presented in **Technical Appendix 11.7: PVA**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
	MD-LOT Argyll and Bute Council	NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025		
94.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Question 11. Do consultees agree with the Applicant's proposed approach to calculate number of guillemot and razorbill adult individuals at breeding colonies by multiplying the colony Individual breeding adult seabird (IND) count by 0.67 (to calculate the number of adult pairs) and then by 2? Although we have accepted this in the past for guillemot and razorbill, as the k value (0.67) was updated for razorbill to 0.75 in Seabirds Count (Burnell et al., 2023), we advise that this value (0.75) should be used instead for razorbill.	These values have been used – see **Technical Appendix 11.2: Baseline Site Characterisation**.
95.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Question 12. Can consultees advise if PVAs are still considered necessary for Arctic tern, common tern and great northern diver in light of the very low mortality estimates for these species? Yes, we advise that PVAs are still required for Arctic tern, common tern and great northern diver. As discussed in the meeting, it might be useful to understand where the range sits for lower and higher impact thresholds even if only the upper value meets the threshold of 0.02. Therefore, it would be useful to see both PVAs presented but our current guidance is that only the PVA which meets the 0.02 threshold is required. It was also noted that when presenting the additional impact on adult survival, the outputs are presented to three decimal points. We advise that these are presented to two decimal points, which means that there are a few scenarios currently marked as not requiring a PVA, which do need a PVA.	PVA modelling has been carried out for these species under Impact 4 (operational displacement) and/or Impact 5 (collision risk), as relevant. PVA modelling was carried out for all species where NatureScot PVA thresholds were met. All PVA input and outputs are located in **Technical Appendix 11.7: PVA**.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			RSPB stated at ETG 4, that regarding kittiwake and great northern diver, where the lower mortality estimate did not require a PVA but the upper one did, part of the rationale for having the upper and lower limits is you get an indication of the probable range of the mortality that could arise.	
96.	NatureScot RSPB Scotland MD-LOT Argyll and Bute Council	MachairWind Offshore Ornithology ETG 4: 02 December 2025 NatureScot email response to questions raised in ETG 4 meeting presentation: 18 December 2025	Question 13. Can consultees provide a list of projects that are anticipated to be submitted around the same time as MachairWind and what cut-off date is reasonable to use for including projects in the quantitative cumulative assessment? We advise that Marine Directorate should be consulted in relation to this query. In relation to the additional cumulative queries posed in the meeting, we are content with projects in the western BDMPS being taken forward for cumulative assessment but highlight that Welsh, English and Irish sites will still need to be considered. For fulmar, we advise that it is now possible to undertake a cumulative assessment. Several proposals have undertaken a quantitative assessment of this species so there are figures available to input into a cumulative assessment for displacement impacts. RSPB stated at ETG 4 that for the east coast projects, gannet tracking data has shown that they go up and round the Scottish north coast, so these may need to be included, highlighting it may not be as clear cut as east vs west coast.	The cumulative assessment has been based on the inclusion of other projects located within the Western Waters BDMPS region and includes all relevant UK and Republic of Ireland projects. Fulmar has been included in the cumulative assessment.
97.	NatureScot	NatureScot email: 21 January 2026 in relation to Greenland white-fronted goose report	Although the report highlights that the predicted impact from the MachairWind Offshore Wind Farm does not meet our threshold for percent point change in annual adult survival rate to be taken forward in the assessment, we feel that further consideration is required. We are aware of a number	Greenland white-fronted goose modelling is presented in **Annex 11.3C: Collision Risk Modelling of Greenland white-fronted goose**. The Applicant updated the Greenland white-fronted goose CRM with the latest available population estimate for this

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			of issues this species is facing whilst at their breeding sites and over-wintering sites within Scotland and therefore advise this species, and potentially barnacle geese, require further consideration. Our understanding is that there is tagging data available for this species and we recommend accessing this data if possible – the research has been collected by Dr Larry Griffin. We request this data is then reviewed to see how the tagged birds are interacting with the Windfarm Development Area, this will help in understanding if there is movement across the Windfarm Development Area by this species and if so, what impact the proposal may have on this species. In addition, we would recommend that the updated population estimate for this species is taken into consideration, as the data published this year shows the population has suffered further declines.	species. Goose tagging data was requested, but it was not made available by the time of submission.

11.4 EXISTING DATA SOURCES

15. **Table 11.3** sets out the information and data sources that have been used to inform this chapter.

Table 11.3 Summary of key datasets and information sources

Dataset	Description	Citation
Britain and Ireland Seabirds Count – the fourth Breeding Seabird Census	Colony counts of 25 species surveyed within Britain and Ireland between 2015 and 2021.	Burnell et al. (2023).
SMP database	Breeding season regional population scale as identified by the SMP Database ran by the JNCC up to 2022 and now operated by the British Trust for Ornithology.	British Trust Ornithology. (2026).
UK seabird colony counts in 2023 following the 2021-22 outbreak of HPAI.	Trends in colony counts of target seabird species affected by HPAI, compared to 2015-2021 Seabirds Count.	Tremlett et al. (2024).
NatureScot Scientific Advisory Committee Sub-Group on Avian Influenza Report on the H5N1 outbreak in wild birds 2020-2023	An assessment of the current and emerging impact and knowledge base of HPAI on wild bird populations in Scotland.	NatureScot. (2023j).
Scientific paper entitled 'GPS tracking reveals highly consistent use of restricted foraging areas by European Storm-petrels *Hydrobates pelagicus* breeding at the largest UK colony: implications for conservation management'.	Tracks of storm-petrels from Shetland	Bolton. (2021).
Scientific paper entitled 'Marine distribution and foraging behaviour of European Storm-petrels *Hydrobates pelagicus* in relation to predation risk, competition and oceanography'	Analysis of additional European storm-petrel tracking data from Shetland, in relation to environmental and ecological variables	Deakin et al. (2026)
Unpublished scientific report for MachairWind Ltd. by National Trust for Scotland, entitled, 'Manx shearwater tracking work on Lunga in 2025'	Tracks and utilisation distributions of Manx shearwaters breeding on the Treshnish Isles, in relation to the WDA	Owen and Morgan (2026) (**Annex 11.2O: Strategic shearwater and storm petrel demography, distribution, and at-sea behaviour to improve understanding of impacts of offshore wind farms on SPA populations in UK waters**)
Report entitled 'Strategic shearwater and storm petrel demography, distribution, and at-sea behaviour to improve understanding of impacts of offshore wind farms on SPA populations in UK waters'	Tracks of adult, immature and fledgling Manx shearwaters from Skomer, Copeland and Rum colonies. Flight height information from tags and laser range finders. This report is produced by the ProcBe OWEC project.	The Crown Estate (2026)

Dataset	Description	Citation
Report entitled, 'Evaluation of seabird attraction to lighting on offshore wind farms'	Review of the evidence for seabird attraction to lighting on lighthouses, vessels, oil and gas platforms and offshore wind farms; information on typical lighting requirements for offshore wind farms; evaluation of the risk of attraction to and disorientation by lighting on offshore wind farms; recommendations on monitoring to improve understanding of how shearwaters and storm-petrels respond to ALAN.	Furness et al. (2026)
Combining habitat modelling and hotspot analysis to reveal the location of high-density seabird areas across the UK.	Model predictions of seabird hotspot distributions around the UK.	Cleasby et al. (2018).
Marine Scotland Science Report 04/14: Statistical Modelling of Seabird and Cetacean data: Guidance Document	Guidance document focusing on statistical issues related to improving wildlife surveys in the measurement of distribution of animals in areas of near-shore and off-shore renewable energy development.	Mackenzie et al. (2013).
An atlas of seabird distribution in northwest European waters	Data were collected from 1979 to 1994 and have been used to describe the seasonal distribution and abundance of over 50 species of seabird, including gulls, terns, sea ducks, skuas and divers. These are supplemented with detailed summaries of the methods used for the collection, processing and interpretation of the data.	Stone et al. (1995).
Distribution maps of cetacean and seabird populations in the North-East Atlantic	Study provides the largest ever collation and standardization of diverse survey data for cetaceans and seabirds, and the most comprehensive distribution maps of these taxa in the North-East Atlantic.	Waggitt et al. (2020).
Breeding density, fine-scale tracking, and large-scale modelling reveal the regional distribution of four seabird species	Tracking of four species of seabirds, kittiwakes, guillemots, razorbills and shags, from multiple colonies around the coast of the UK since 2010.	Wakefield et al. (2017).
Important at-sea areas for seabirds	Delineating high density sites for kittiwakes, guillemots, razorbills and shags, using seabird distribution models and hotspot mapping.	Cleasby et al. (2020).
Islay offshore windfarm boat-based surveys	Boat based surveys to identify seabirds present at the proposed Islay offshore windfarm, undertaken from 2009 to 2012.	Institute of Estuarine and Coastal Studies. (2012).

Dataset	Description	Citation
Argyll Array offshore windfarm boat-based surveys	Boat based surveys to identify seabirds present at the proposed Argyll Array Offshore Windfarm, undertaken from 2009 to 2011.	RPS. (2014).
BirdLife seabird tracking database	The BirdLife International Seabird Tracking Database is the largest collection of seabird tracking data in existence. It serves as a central store for seabird tracking data from around the world and aims to help further seabird conservation work and support the tracking community. Relevant datasets will be consulted.	BirdLife International. (2026).
Study of collision risk for birds	Review of the availability of data to inform key parameters for the assessment of collision risk to migrating birds.	Woodward et al. (2023).
Multi-colony tracking study of two sympatric seabirds	Tracking of Guillemot and Razorbill colonies, based around the northern UK, across two non-breeding seasons.	Buckingham et al. (2022).

11.4.1 Regional Distribution of Seabirds

16. Aerial and vessel survey data have been presented in a range of studies to show spatial and temporal distributions of seabirds, including the key seabird species assessed in this report, around the UK (Kober et al., 2010; Bradbury et al., 2014; Wakefield et al., 2017; Cleasby et al., 2018; Waggitt et al., 2020). These data have been used to predict densities of seabirds in the northeast Atlantic (Waggitt et al., 2020), map seabird sensitivity to offshore windfarms in English territorial waters (Bradbury et al., 2014) and identify possible SPAs in the marine environment (Kober et al., 2010). These studies have provided background information on how seabirds utilise the sea in the region surrounding the WDA.

11.4.2 GPS Tracking of Seabirds

17. Tracking studies for key seabird species within foraging range (mean maximum +1Standard Deviation (SD)) to the WDA are available from the BirdLife International Seabird Tracking Database. These data have been used as additional context to aid understanding of patterns in bird abundance and distribution.

18. Tracking of key seabird species from colonies with potential connectivity to the WDA are available from the BirdLife International Seabird Tracking Database. Summaries of Global Positioning System (GPS) tracking projects and the number of tracked individuals logged on the Tracking Database for key marine species considered in the assessment are described in **Technical Appendix 11.2: Baseline Site Characterisation** to give additional context on the patterns of abundance and distribution seen in the WDA plus 4 km buffer during the Project’s digital aerial survey programme. For each species, the BirdLife International Seabird Tracking Database was searched to identify if any GPS tracks have been recorded within a 10 km area surrounding the WDA. Additionally, information from four very recent tracking studies of Manx shearwaters and European storm-petrels

was also used (Bolton et al., 2025; Deakin et al., 2026; The Crown Estate, 2026; Owen and Morgan, 2026).

11.4.3 Counts of Seabird Colonies

19. Through the SMP, regular monitoring of 25 seabird species that regularly breed in Britain and Ireland has been undertaken since 1986. In addition to the annual counts at a sample of colonies provided through the SMP, periodic breeding seabird censuses have taken place to help identify changes in abundance and distribution. The last complete count, the ‘Seabirds Count’, was undertaken between 2015 and 2021 (Burnell et al., 2023). This is the fourth national seabird census to take place in Britain and Ireland, with previous censuses being:

- Operation Seafarer - count data collected in 1969 and 1970 (Cramp et al., 1974);
- Seabird Colony Register (SCR) Census - count data collected between 1985 and 1988 (Lloyd et al., 1991); and
- Seabird 2000 - count data collected between 1998 and 2002 (Mitchell et al., 2004).

20. Data from the Seabirds Count 2015–2021 census, which highlighted trends in colony counts for breeding birds, particularly since the previous census (Seabird 2000) were collated for species included in the assessment. NatureScot advised at the ETG Meeting 2 (ETG 2, 23 January 2024) that some new colony counts may be available since the Seabirds Count data were published. Therefore, the SMP database was searched to provide any updated colony counts recorded from 2022 to 2025. If updated SMP colony counts were available, these were used to replace colony counts provided in the Seabirds Count dataset. Colony counts are provided in **Technical Appendix 11.2: Baseline Site Characterisation, Annex 11.2M: Regional Breeding Adult Population Estimates**.

11.5 SITE-SPECIFIC SURVEY DATA

21. In addition to the existing data sources identified in **Section 1.4**, the Project has utilised the following site-specific surveys to inform the EIA (**Table 11.4**).

Table 11.4 Site-specific survey data

Dataset	Year(s)	Description
Project’s DAS	2021 to 2023	DAS undertaken by APEM for the Project across the WDA, including a 4 km buffer (**Figure 11.1**). Monthly surveys were actioned over 30 months from April 2021 to September 2023 inclusive.
Third-party DAS	2020 to 2021	DAS undertaken by APEM on behalf of a third-party developer. Third-Party DAS data were collected in an area which covered the Third-Party Boundary plus a 6 km buffer, this Third-Party survey area partially overlapped with the Project WDA plus 4 km buffer (**Figure 11.1**). Monthly surveys were actioned over 16 months from October 2020 to January 2022 inclusive. Survey methods were very similar to those used to collect baseline survey data, using the same provider. There was a large degree of overlap between the Project WDA and Third-Party survey areas, approximately 91%.

11.6 OFFSHORE ORNITHOLOGY STUDY AREA

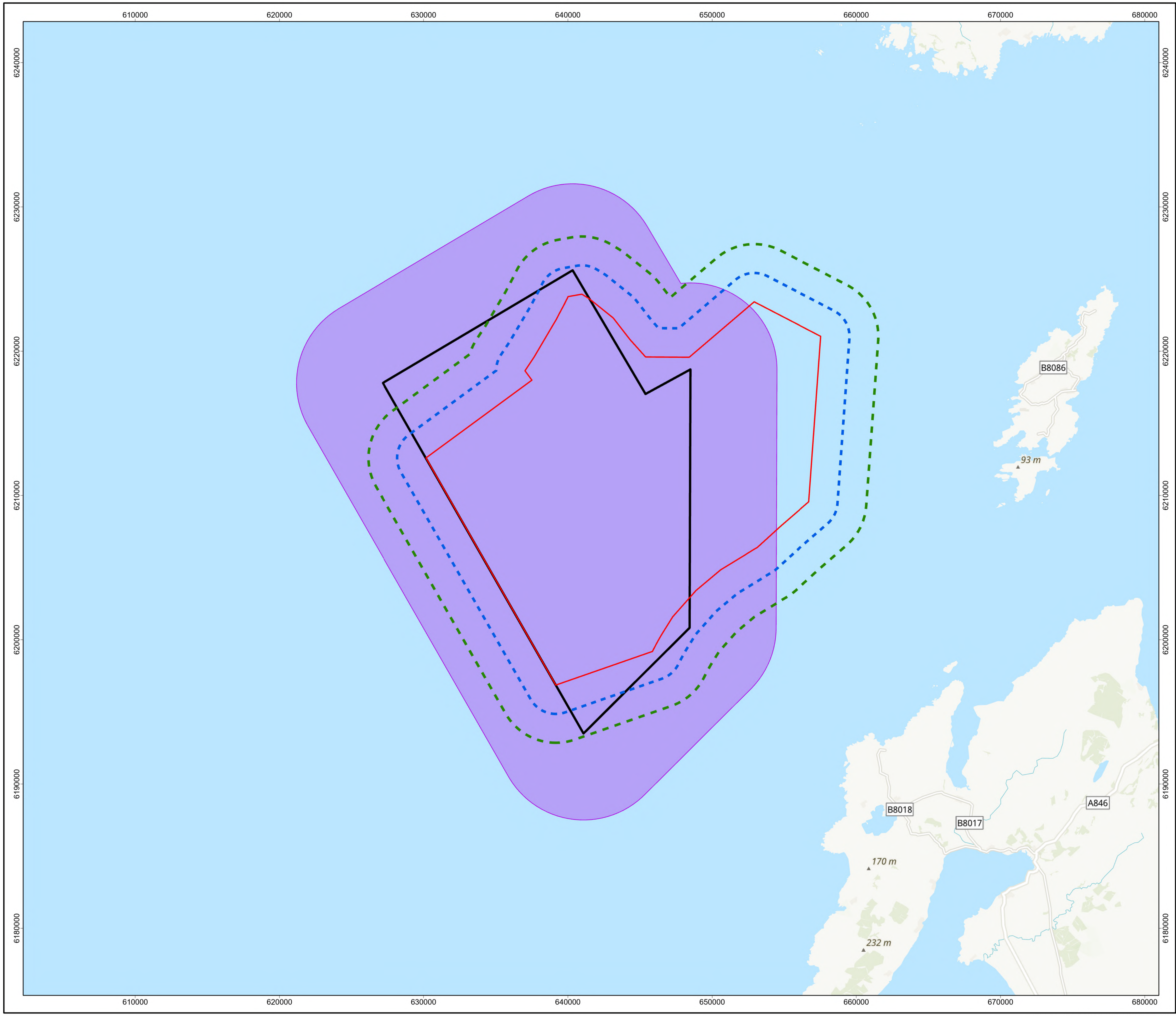
22. The purpose of a Study Area is to set the geographical boundary within which the existing environment is described, and the ornithology impact assessment has been conducted.

23. The offshore ornithology Study Area (**Figure 11.1**) is defined as the spatial extent of the WDA and a 4 km buffer around this to meet the minimum buffer area, as recommended by NatureScot (2023a) and confirmed by NatureScot in their Scoping Opinion (22 November 2024, see **Table 11.2**).

11.7 REALISTIC WORST-CASE SCENARIOS

24. The final design of the WDA will be confirmed by detailed engineering studies post-consent. To undertake a robust and precautionary impact assessment, the realistic worst-case design scenarios (i.e., those that would cause the greatest impact) are defined from the Project Design Envelope; ensuring that all other design scenarios would have equal or less impact. Please see **Chapter 5 EIA Methodology** for further details on the design envelope approach.

25. The realistic worst-case scenarios for the offshore ornithology assessment are summarised in **Table 11.5** below. These are based on the project design as described in **Chapter 3 Project Description**.



Windfarm Development Area (WDA)

WDA 2 km Buffer

WDA 4 km Buffer

Third Party Boundary

Third Party Boundary 6 km Buffer

N

0 5 10 Kilometres

REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
1	23/04/2026	MMM	LD	NG	NG

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000206		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:250,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Windfarm Development Area and Third Party Boundary

Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, OceanWise, Esri, GEBCO, Garmin, NaturalVue, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

NOT TO BE USED FOR NAVIGATION

MacArthur Green

ScottishPower Renewables

Project: Y:_MG\Projects\Machair_Copy_20251027\03_GIS\06_Aprx\Figures_Final\MCW-DWF-ENV-MAP-RHS-000206_Machairwind_WindfarmDevelopmentAreaandThirdPartyBoundary.aprx
Name: MCW-DWF-ENV-MAP-RHS-000206_Machairwind_WindfarmDevelopmentAreaandThirdPartyBoundary

Table 11.5 Realistic worst-case scenarios for impacts on offshore ornithology

Impact	Realistic Worst-Case Scenario	Rationale
Construction		
Impact 1. Direct distributional responses and displacement effects	• Indicative WDA construction duration of 5 years; • Maximum construction schedule of 24 hours a day, 7 days a week; • Up to a maximum of 117 construction vessels operating within the WDA at any one time, with up to 5,699 vessel trips across entire construction period (round trips to and from port). **Piling:** • No simultaneous piling. • Piling period 2030 Q2 to 2034 Q4 Monopiles • Maximum number of monopiles: 144 • Maximum pile diameter: 15 m • Maximum hammer energy: 6,600 kJ • Maximum number of monopiles installed per day: one • Maximum piling duration per monopile = 320 minutes • Maximum piling duration for maximum monopiles = 768 hours which = 32 days Pin-piles • Maximum number of pin-piles for WTGs: 576 • Maximum number of pin-piles for OSPs: 32 (16 per OSP) • Total number of pin-piles: 608 • Maximum pile diameter: 4.5 m • Maximum hammer energy: 4,400 kJ • Maximum number of pin-piles installed per day: six • Maximum piling duration per pin-pile = 195 minutes • Maximum piling duration for maximum pin-piles = 1976 hours which = 82.3 days	Maximum estimated number of vessels, duration of piling, and construction activity within the WDA would cause greatest disturbance and displacement to birds.
Impact 2. Indirect disturbance and displacement of prey species	• The worst-case scenarios for (i) Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition; (ii) Temporary Physical Disturbance / Habitat Loss; and (iii) Underwater noise and vibration are set out in the Realistic Worst-case Scenarios in **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish**.	For seabed preparation disturbance and habitat loss for WTGs and other infrastructure, the largest area is associated with the higher number of smaller turbines scenario.

Impact	Realistic Worst-Case Scenario	Rationale
Impact 3. Artificial Lighting	• Up to a maximum of 117 construction vessels operating within the WDA at any one time; • Maximum construction schedule of 24 hours a day, 7 days a week; • A total of up to 5 years of construction period; and • Up to 5,699 vessel trips across entire construction period (round trips to and from port).	Maximum estimated number of vessels and duration of construction activity within the WDA would result in greatest temporal and spatial exposure of birds to artificial light.
Operation and Maintenance		
Impact 4. Direct distributional responses, displacement and barrier effects	• WTGs spaced evenly within the WDA in a regular pattern; • Maximum of 144 WTGs under smallest WTG (15 MW) scenario; • Minimum spacing of 944 m (smallest WTG size) between WTGs; Maximum of 423 vessel round trips required for routine operational and planned maintenance activities each year. • Maximum estimated export cable repairs/replacement events - lifetime quantity within the WDA (35 years) = 2; • Maximum estimated OSP link cable repairs/replacement events - lifetime quantity within the WDA (35 years) = 4 • Maximum estimated IAC repairs/replacement events - lifetime quantity (35 years) = 10.	• Represents maximum density of WTGs and structures across the WDA, which maximises the potential for avoidance and displacement (including potential barrier) to birds from the WDA. • Other options represent a smaller total area occupied and reduced density of WTGs (e.g. increased spacing). • Assessment assumes varying displacement from WDA and a buffer, where appropriate.
Impact 5. Indirect effects due to habitat loss / change for key prey species	The worst-case scenarios for (i) Impacts on SSCs and sediment re-deposition; (ii) Temporary Physical Disturbance / Habitat Loss; (ii) Permanent habitat loss; (iv) colonisation of introduced hard substrate; (v) Interactions with Electro-magnetic Fields (EMF); (vi) Heat exposure from subsea electrical cables; (vii) Underwater noise and vibration; and (viii) Changes in fishing activity are set out in the Realistic Worst-case Scenarios in **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish**.	• Maximum area of seabed lost potentially causes greatest displacement to prey species and consequently birds from the WDA. • Maximum area of permanent habitat creation causes greatest attraction to prey species and consequently birds within WDA. • Maximum length of inter-array and interconnector cables will result in the greatest potential for EMF effects on prey species. • Maximum number of WTGs and structures across the WDA, which maximises the potential for underwater noise and vibration.
Impact 6. Collision risk	• Maximum of 144 WTGs x 236 m rotor diameter; • WTGs spaced evenly across the full WDA; and • Operational life up to 35 years.	• Collision risk modelling shows that 144 x 236 m rotor diameter WTGs (Small WTG scenario) have largest collision impact risk.

Impact	Realistic Worst-Case Scenario	Rationale
Impact 7. Artificial operational lighting	See Impact 4	• Represents maximum density of WTGs and other light emitting structures across the WDA, thereby maximising the potential for impacts. • Represents maximum numbers of O&M vessels and maintenance activities which require light.
Decommissioning		
Impact 9. Direct distributional responses and displacement effects	Disturbance is anticipated to be similar in nature but of lower magnitude than during construction, but specific details are not currently known.	Maximum estimated number of vessel movements would cause greatest displacement to birds on site.
Impact 10. Artificial Lighting	As per Impact 3, albeit duration of decommissioning is unknown.	Maximum estimated number of vessels and duration of decommissioning activity within the WDA would result in greatest temporal and spatial exposure of birds to artificial light.
Impact 11. Indirect disturbance and displacement of prey species	As per Impact 2. The worst-case scenarios for decommissioning would be similar to those defined in the construction phase.	The area at risk of disturbance from decommissioning will likely be lower than that presented in construction. Decommissioning will not involve seabed preparation and cable burial and therefore impacts on the seabed are likely to be similar in nature but reduced in magnitude compared to construction.

11.8 EXISTING BASELINE ENVIRONMENT

26. This section characterises the offshore ornithology existing baseline conditions, using site-specific survey data (**Section 11.5**) alongside publicly available data sources (**Section 11.4**) deemed of relevance to the Study Area (**Section 11.6**). This sets the context for the identification of IOFs taken forward to assessment, mitigation measures (**Section 11.9**) and scoping of potential impacts which then feeds into the assessment of significance of effects (**Section 11.11**) due to the WDA-alone, followed by consideration of cumulative effects (**Section 11.12**) and potential transboundary impacts (**Section 11.13**).

11.8.1 Baseline Overview

27. The WDA is located in waters off the west coast of Scotland approximately 12.4 km west of Colonsay and 15 km northwest of Islay with important seabird colonies to the northeast on the island of Colonsay and to the south on Rathlin Island. These colonies include important numbers of fulmar (*Fulmarus glacialis*), kittiwake (*Rissa tridactyla*), guillemot (*Uria aalge*) and puffin (*Fratercula arctica*).

28. Smaller populations of shag (*Gulosus aristotelis*), cormorant (*Phalacrocorax carbo*), great black-backed gull (*Larus marinus*), herring gull (*Larus argentatus*), Arctic tern (*Sterna paradisaea*) and black guillemot (*Cepphus grylle*) also occur in the area.

29. Other breeding colonies of seabirds include Manx shearwater (*Puffinus puffinus*) colonies on Rum and Copeland Island and European storm-petrel (*Hydrobates pelagicus*) colonies on Lunga in the Treshnish Isles. The nearest gannet (*Morus bassanus*) colony is on Ailsa Craig in the Firth of Clyde and is the most likely source of individuals present in the breeding season.

30. In the non-breeding season, nearshore waters are important for several species of wintering water birds, particularly common eider (*Somateria mollissima*) and great northern diver (*Gavia immer*).

31. Migratory ducks, geese, swans and shorebirds also fly through the region on passage between their breeding locations in Iceland, Greenland and Canada and wintering areas in Scotland and elsewhere in the UK. Internationally important numbers of Greenland white-fronted goose (*Anser albifrons flavirostris*) and Greenland barnacle goose (*Branta leucopsis*) winter on Islay, with important numbers of Canadian light-bellied brent goose (*Branta bernicla hrota*) stopping on passage.

11.8.2 Designated Sites

32. Ornithological designated sites (SPAs and Ramsar sites) which may have connectivity to the WDA include those designated for breeding and non-breeding seabirds, marine sites designated for wintering waterfowl and roosting gulls, and those for terrestrial (migratory), coastal or marine bird interests (typically overwintering aggregations).

33. Seabird breeding sites may be connected during the breeding season (e.g. the WDA is within foraging range of breeding birds) or during the non-breeding season (e.g. birds pass through during spring and autumn migration or are present overwinter), or during both periods. Wintering waterfowl sites may be connected to the WDA through vessels associated with the WDA passing through or close to sites. Terrestrial/coastal sites designated for migrant species outside the breeding season may be connected on the grounds of passage movements through the WDA.

34. The WDA does not overlap with any SPA or Ramsar site, with the closest seabird site being North Colonsay and Western Cliffs SPA, approximately 12 km away; however, the WDA is within foraging range of species from this and other designated sites, as well as colonies that are not designated.

35. Full consideration of connectivity of SPAs and Ramsar sites is provided in the **RIAA**.

11.8.3 Baseline Digital Aerial Surveys

36. Full details of the baseline DAS and analysis undertaken to develop the offshore ornithology baseline is provided in **Technical Appendix 11.2: Baseline Site Characterisation**, which includes information on survey design and methods, as well as the analysis techniques implemented to characterise the baseline environment using the available survey data.

37. A summary of total raw counts of seabirds, including birds which could not be identified to species level, but were assigned to a broader species group, recorded during DASs as sat on the water and in flight in the WDA plus 4 km is presented in **Table 11.6**.

38. A small number of dead birds, possibly victims of HPAI, were recorded during surveys floating in the sea within transects including: 11 gannets, two kittiwakes and five birds not identified to species.

Table 11.6 Summary of raw counts (not apportioned or corrected) of all birds identified to species recorded within the offshore ornithology Study Area (WDA plus 4 km buffer).

Species	Sat on the water	Flying	Sat on the water and flying
Guillemot	49,196	1,374	50,570
Manx Shearwater	7,778	3,245	11,033
Guillemot/Razorbill	10,524	287	10,811
Kittiwake	4,126	5,754	9,880
Razorbill	7,972	346	8,318
Puffin	2,721	13	2,734
Gannet	552	437	989
Auk/Shearwater species	620	39	659
Auk species	413	7	420
Fulmar	95	208	303
Herring Gull	143	76	219
Great Black-backed Gull	156	55	211
Arctic Tern	5	87	92
European Storm Petrel	0	85	85
Commic Tern	21	59	80
Wader species	0	47	47
Unidentified Bird species	24	8	32
Great Skua	6	21	27
Large Gull species	22	3	25
Common Gull	2	21	23
Great Northern Diver	16	1	17
Common Tern	0	12	12
Small Gull species	7	4	11
Gull species	9	0	9

Species	Sat on the water	Flying	Sat on the water and flying
Cormorant/Shag	6	1	7
Arctic Skua	1	4	5
Sooty Shearwater	1	4	5
Fulmar/Gull species	2	1	3
Diver species	2	0	2
Red-throated Diver	0	2	2
Golden Plover	0	1	1
Great Shearwater	0	1	1
Grey Phalarope	0	1	1
Lesser Black-backed Gull	1	0	1

Species observed outwith the WDA plus 4 km buffer are not included in the table. Additionally, some observations were re-classified to other species or group-level species prior to analysis. Refer to **Technical Appendix 11.2: Baseline Site Characterisation** for details.

39. Based on NatureScot's offshore guidance notes, seabird species taken forward for assessment are those which were recorded during DAS and which are considered to be at potential risk either due to their abundance, potential sensitivity to offshore windfarm impacts or due to biological characteristics (e.g., commonly fly at rotor heights) which make them potentially susceptible.

40. Some seabird species were recorded rarely within the offshore ornithology Study Area. Therefore, to concentrate the scope of the assessment on species which may be subject to significant effects at a population level, species with sufficient data for robust analysis were scoped into the assessment:

- Species considered susceptible to collision with 10 or more birds recorded flying in the WDA in 29 DAS (discussed with NatureScot at the ETG meeting 4, 02 December 2025). For a quantitative collision risk assessment, species include: Arctic tern, common tern, gannet, great-black-backed gull, herring gull and kittiwake, refer to **Technical Appendix 11.3 Collision Risk Modelling** for details;
- Species considered susceptible to disturbance with 10 or more birds recorded flying and sat on the water in the WDA plus a 2 km buffer (for all species except divers and seaducks) or the WDA plus a 4 km buffer (for diver and seaduck species only) in 30 DAS samples (discussed with NatureScot at the ETG meeting 4, 02 December 2025). For a quantitative displacement assessment, species include: great northern diver, kittiwake, Arctic tern, common tern, guillemot, razorbill, puffin, fulmar and gannet, refer to **Technical Appendix 11.4: Displacement** for details; and
- Species considered susceptible to attraction to artificial lights within an offshore windfarm potentially leading to increased collision risk recorded flying and sat on the water in the WDA plus a 4 km buffer. For a semi-quantitative light attraction assessment, species include Manx shearwater and European storm-petrel (discussed with NatureScot at the ETG meeting 4, 02 December 2025), refer to **Annex 11.2P: Evaluation of seabird attraction to lighting on offshore windfarms** for details.

41. The 13 seabird species (the 'IOFs', as per CIEEM, 2022) taken forward to assessment are presented in **Table 11.7**, which also shows their conservation status, including population trends in relation to climate change.

Table 11.7 Summary of nature conservation status of seabird species screened into assessment

Species	Scientific Name	Conservation status
Kittiwake	*Rissa tridactyla*	Birds of Conservation Concern (BoCC) Red listed, Birds Directive Migratory Species, (International Union for Conservation of Nature) IUCN Red List 'Vulnerable' status. 'High risk' breeding population vulnerability to climate change (Pearce-Higgins, 2021).
Great black-backed gull	*Larus marinus*	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'High risk' breeding population vulnerability to climate change.
Herring gull	*Larus argentatus*	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'High risk' breeding population vulnerability to climate change.
Arctic tern	*Sterna paradisaea*	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'High risk' breeding population vulnerability to climate change.
Common tern	*Sterna hirundo*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'Medium benefit' breeding population vulnerability to climate change.
Guillemot	*Uria aalge*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'Medium risk' breeding population vulnerability to climate change.
Razorbill	*Alca torda*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Near Threatened' status. 'Medium risk' breeding population vulnerability to climate change.
Puffin	*Fratercula arctica*	BoCC Red listed, Birds Directive Migratory Species. IUCN Red List 'Vulnerable' status. 'High risk' breeding population vulnerability to climate change.
European storm-petrel	*Hydrobates pelagicus*	BoCC Amber listed, Birds Directive Migratory Species. IUCN Red List 'Least Concern' status. 'High risk' breeding population vulnerability to climate change.
Fulmar	*Fulmarus glacialis*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'High risk' breeding population vulnerability to climate change.
Gannet	*Morus bassanus*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. 'Limited impact' breeding population vulnerability to climate change.
Manx shearwater	*Puffinus puffinus*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status. Not assessed breeding population vulnerability to climate change.
Great northern diver	*Gavia immer*	BoCC Amber listed Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.

11.8.4 Data Analyses

11.8.4.1 Density and Abundance Estimates

42. NatureScot Guidance Note #2 on baseline characterisation advises that methods used to extrapolate from the density sample to the population of the Study Area are presented (so-called design-based estimates). Seabird abundance estimates from the site-specific DASs and how they were derived are therefore presented in **Technical Appendix 11.2: Baseline Site Characterisation**. Detail from this baseline report has not been repeated within this chapter to present a clear and concise impact assessment. A summary of this process is however provided below. Note that DAS data can also be used to derive model-based abundance estimates for species and surveys with sufficient observations. However, there are almost always 'gaps' in such an analysis across the period of a baseline survey campaign, when even common species are recorded too infrequently to permit successful model fitting. It is not appropriate to fill these gaps with design-based estimates due to differences in the assumptions for the two methods and therefore to ensure a consistent dataset across all surveys for all species only design-based estimates have been used for this assessment.

11.8.4.1.1 Density and Abundance Estimates per Survey

43. Design-based densities (birds/km^2) and abundances were estimated from raw bird counts obtained from the baseline DAS data recorded in each of the 30 DAS samples. Raw bird counts included apportioned birds and birds which had been corrected for availability bias.

44. Density estimates for each species in each survey were calculated as the raw bird counts divided by the survey area.

45. Abundance estimates were calculated as the density multiplied by the total area over which the abundance was to be estimated (the WDA, the WDA plus 2 km buffer or the WDA plus 4 km buffer). This simple extrapolation assumes the same densities were present in the un-surveyed space between transects as in the transects.

46. These density and abundance estimates were calculated for individual species, species groups, apportioned species (where appropriate) and apportioned/corrected species (for guillemots, razorbills and puffins).

11.8.4.1.2 Design-Based Methods: Quantifying Variance and Uncertainty

47. The simple extrapolation approach described above dos not have any measure of uncertainty associated with it. Therefore, to quantify uncertainty around density and abundance estimates, a 'bootstrap' approach was used.

48. A non-parametric bootstrap of 1,000 iterations with resampling was used to estimate standard deviation (SD), lower 95% bootstrap confidence intervals (LCI), upper 95% confidence bootstrap confidence intervals (UCI) and coefficient of variation (CV). This resampling procedure was conducted separately for birds recorded in flight, sat on the water and for both birds sitting and flying combined.

11.8.4.1.3 Design-Based Methods: Apportioning Species Groups to Species-Specific Categories

49. DAS imagery was analysed to classify observations of birds to species level where possible. In instances when this was not possible, observations were identified to a higher taxonomic level called a 'species group' (e.g. 'Large gull species', 'Guillemot/Razorbill', etc.). These species group identifications were apportioned to species specific identifications where possible according to a procedure examining the ratios of identified birds within lower taxonomic groups. Apportioning was

applied to both raw counts and bootstrapped data (allowing for quantifying of uncertainty for apportioned categories).

50. Apportioning ratios were calculated for each species per survey and by behaviour (apportioning ratios for species group identifications that were sitting were calculated separately from species group identifications that were flying); however, within a survey, apportioning ratios were calculated on the full extent of the data within the Study Area.

51. In some instances where species groups would virtually all be assigned to a single category, these observations were re-assigned prior to analyses. This was done for four categories: all 'small shearwater species' (n = 626 across all surveys within the 4 km buffer boundary) were assigned to Manx shearwater; all 'shearwater species' (n = 11 across all surveys within the 4 km buffer boundary) were assigned to Manx shearwater; all 'storm-petrel species' (n = 85 across all surveys within the 4 km buffer boundary) were assigned to European storm-petrel; all 'tern species' (n = 11 across all surveys within the 4 km buffer boundary) were assigned to 'Commic' tern (comprising common tern or Arctic tern) and then apportioned to Arctic terns and common terns.

52. Five species groups were not apportioned:

- The 'cormorant/shag' species group included seven identifications within the WDA plus 4 km buffer across all 30 surveys. However, as no cormorants or shags were specifically identified within the Study Area, it was not possible to apportion the 'cormorant/shag' species group;
- The 'fulmar/gull species' species group included three identifications within the Study Area across all 30 surveys. Due to the very small size of this species group, it was not apportioned to individual species as only small fractions of a bird would be apportioned;
- The 'Diver species' species group included two identifications within the Study Area across all 30 surveys. Due to the very small size of this species group, it was not apportioned to individual species as only small fractions of a bird would be apportioned;
- The 'Wader species' species group included 47 identifications within the Study Area across all 30 surveys. However, as only one grey phalarope and one golden plover were specifically identified within the Study Area, there were insufficient data to inform an apportioning ratio; and,
- The 'Unidentified Bird species' species group included 32 identifications within the Study Area across all 30 surveys. Without any classification to identify what sort of birds these were, it was not possible to calculate an apportioning ratio for these unidentified birds.

11.8.4.1.4 Availability Bias of Auks

53. Auks (e.g. guillemots, razorbills and puffins) spend a proportion of their time foraging beneath the water surface and therefore a proportion of individuals present in an area will be missed during the period the survey aircraft passes over. Density and abundance estimates were adjusted to account for these individuals not recorded during digital aerial surveys by multiplying the number of birds recorded as sat on the water with species-specific correction factors (birds in flight are not adjusted). The adjustment rates used were 1.311 for guillemot and 1.211 for razorbill (i.e. this assumes 24% of guillemots and 17% of razorbills are underwater at any given time; (Thaxter et al., 2013) and 1.165 for puffin (i.e. 14% of puffins were assumed to be underwater at any time; (Spencer, 2012). Great northern divers also forage by pursuit diving from the sea surface. However, no correction for availability bias was made for great northern diver, as the appropriate correction factor for that species is unknown.

11.8.4.2 Biological Seasons

54. Impacts on IOFs have been assessed in this chapter in relation to relevant breeding and non-breeding biological seasons, as advised in the NatureScot Guidance Note #9. A summary is presented in **Table 11.8**.

55. NatureScot guidance defines some months as being split between the breeding and non-breeding seasons, e.g. for kittiwake, the first half of April is considered to be part of the non-breeding season, and the second half of April is part of the breeding season. For the non-breeding season, BDMPS seasons, taken from Furness (2015), are also presented in **Table 11.8**.

Table 11.8 Species specific seasonal definitions for all species recorded during DAS, taken from NatureScot Guidance Note #9 and the BDMPS report (Furness, 2015). Note, species recorded during DAS but not included in Guidance Note #9 nor the BDMPS report are not included here.

Species	NatureScot (2023)		Furness (2015)		
	Breeding season	Non-breeding season	Spring migration	Autumn migration	Winter
Kittiwake	mid-April to August	September to mid-April	January to April	August to December	-
Black-headed gull[2]	April to August	September to March	-	-	-
Common gull[2]	April to August	September to March	-	-	-
Great black-backed gull	April to August	September to March	September to March (single non-breeding BDMPS season)		
Herring gull	April to August	September to March	September to March (single non-breeding BDMPS season)		
Lesser black-backed gull	mid-March to August	September to mid-March[1]	March to April	August to October	November to February
Common tern	May to mid-September	mid-September to April[1]	April to May	Late July to September	-
Arctic tern	May to August	September to April[1]	Late April to May	July to early September	-
Great skua	mid-April to mid-September	mid-September to mid-April[1]	March to April	August to October	November to February
Arctic skua	May to August	September to April	April to May	August to October	-
Guillemot	April to mid-August	mid-August to March	Single non-breeding season: August to February		
Razorbill	April to mid-August	mid-August to March	January to March	August to October	November to December
Black guillemot[2]	April to August	September to March	-	-	-
Puffin	April to mid-August	mid-August to March	Single non-breeding season: mid-August to March		
Red-throated diver	May to mid-September	mid-September to April	February to April	September to November	December to January
Great northern diver	N/A[1]	October to mid-May	Single non-breeding season September-May		
European storm-petrel[2]	mid-May to October	November to mid-May[1]	-	-	-

Species	NatureScot (2023)		Furness (2015)		
	Breeding season	Non-breeding season	Spring migration	Autumn migration	Winter
Fulmar	April to mid-September	mid-September to March	December to March	September to October	November
Sooty shearwater[2]	Not a breeding species in the UK	Not present in significant numbers	-	-	-
Great shearwater[2]	Not a breeding species in the UK	Not present in significant numbers	-	-	-
Manx shearwater	April to mid-October	mid-October to March	Late March to May	August to early October	-
Gannet	mid-March to September	October to mid-March	December to March	September to November	-

1) *Not present in significant numbers in Scottish marine areas.*
2) *Species not included in Furness (2015).*

11.8.5 Design-Based Density Estimates

11.8.5.1 Densities of Birds in Flight

56. Density estimates of birds in flight within the WDA in each calendar month are a key input into CRM which estimates the number of birds that might collide with the Project's WTGs for each calendar month (see **Technical Appendix 11.3: Collision Risk Modelling** for details of methodology and rationale of modelling).

57. NatureScot provides guidance on how to assess collision risk in their Guidance Note #7. This guidance advises use of the 2022 update to the stochastic collision risk modelling (sCRM) tool shiny app (Caneco, 2022) and to present outputs for both stochastic and deterministic CRM using this tool. Density inputs for stochastic CRM are 1,000 bootstrapped density estimates per calendar month (see **Technical Appendix 11.3: Collision Risk Modelling** for details of inputs; all bootstrapped densities used to inform sCRM and calculate monthly means for deterministic CRM are presented in **Annex 11.3A: Bootstrapped density inputs to sCRM**).

58. Stochastic CRM considers uncertainty in collision risk modelling inputs and outputs, which deterministic CRM does not, although deterministic CRM produces very similar outputs to the mean from sCRM since they share the same underlying calculations. The results of sCRM have been used in this assessment, however deterministic CRM outputs have also been produced for information purposes (**Annex 11.3B: Deterministic CRM inputs and outputs** for details **and Annex 11.3A: Bootstrapped density inputs to sCRM** for bootstrapped densities used to derive monthly mean densities).

11.8.6 Mean Seasonal Peak Abundance Estimates of Birds in Flight and on Sea

59. MSP abundance estimates per biological season of all birds (flying and on the sea) in the WDA plus 2 km buffer (for all species except divers and seaducks) or the WDA plus 4 km buffer (divers and seaduck species) are a key input into the displacement assessment which estimates mortality of displaced birds for each biological season (see **Technical Appendix 11.4: Displacement** for a detailed description of methodology).

60. As advised in NatureScot Guidance Note #8, MSP abundance estimates were used in the displacement matrices. MSP abundances were selected from abundance estimates generated from 30 DAS samples, selected from Project DAS surveys and Third-Party DAS surveys.

61. It was agreed with NatureScot to use 30 selected DAS samples to ensure two complete breeding and non-breeding seasons from which to select a peak abundance (NatureScot letter dated 7 August 2025) for all displacement species where relevant, ensuring the peak abundance was captured for all seasons. Note that as there was no Project or Third-Party DAS survey data available in June 2022, MSP estimates were not calculated for the breeding season in 2022 for any species. Consequently, for Arctic tern and common tern, as MSP was not estimated for the breeding season in 2022, MSP was also not estimated for the spring migration and autumn migration seasons in 2022 (spring and autumn migration MSP values were calculated from abundance data in 2021 and 2023).

62. MSPs were calculated as the peak abundance for each season, with seasonal peaks from each of the two years of survey then averaged (**Table 11.9**). Abundance estimates used to calculate MSPs for each species are presented in Table 3 to Table 11 of **Technical Appendix 11.4: Displacement**. For a full presentation of abundance estimates recorded in the WDA, WDA plus 2 km and WDA plus 4 km for all species in all 30 DAS samples, refer to **Annex 11.2K: Abundance estimates per survey of sitting and flying birds**.

63. For each species assessed for displacement impacts, the peak abundance recorded within each defined season in each year was identified. When a month was split between breeding and non-breeding seasons, as defined in the NatureScot 2023 Guidance Note #9, it was assumed that the abundance in that month was appropriate for consideration for both the breeding and non-breeding season when identifying the seasonal peak.

Table 11.9 Summary of Annual and Mean Seasonal Peak (MSP) abundance calculations of birds recorded in flight and on the sea in the WDA plus 2 km buffer (4 km buffer for great northern diver).

Species	Season	Year 1	Year 2	MSP
Great northern diver	Non-breeding season (NatureScot)	12.7 (May 22)	19.6 (May 23)	16.2
Kittiwake	Breeding season (NatureScot)	1188.9 (May 21)	1253.1 (Jun 23)	1221.0
	Non-breeding season (NatureScot)	7752.7 (Nov 21)	3556.1 (Oct 22)	5654.4
	Spring migration (BDMPS)	3496.7 (Apr 22)	3480.4 (Feb 23)	3488.6
	Autumn migration (BDMPS)	7752.7 (Nov 21)	3556.1 (Oct 22)	5654.4
Arctic tern	Breeding season (NatureScot)	120.7 (May 21)	62.1 (May 23)	91.4
	Spring migration (BDMPS)	120.7 (May 21)	62.1 (May 23)	91.4
	Autumn migration (BDMPS)	14.6 (Aug 21)	55.7 (Jul 23)	35.2
Common tern	Breeding season (NatureScot)	125.6 (Aug 21)	0	62.8
	Spring migration (BDMPS)	0	0	0
	Autumn migration (BDMPS)	125.6 (Aug 21)	0	62.8
Guillemot	Breeding season (NatureScot)	14957.5 (May 21)	39233.2 (Jul 23)	27095.4
	Non-breeding season (NatureScot)	33381.8 (Mar 22)	23681.1 (Feb 23)	28531.5
Razorbill	Breeding season (NatureScot)	360.6 (May 21)	4911.5 (Jul 23)	2636.1
	Non-breeding season (NatureScot)	7242.8 (Mar 22)	6659.9 (Mar 23)	6951.4
	Spring migration (BDMPS)	7242.8 (Mar 22)	6659.9 (Mar 23)	6951.4

Species	Season	Year 1	Year 2	MSP
	Autumn migration (BDMPS)	363.4 (Sep 21)	5821.4 (Oct 22)	3092.4
	Winter (BDMPS)	6470.1 (Nov 21)	3926.4 (Dec 22)	5198.3
Puffin	Breeding season (NatureScot)	290.0 (Jun 21)	1653.3 (Jul 23)	971.7
	Non-breeding season (NatureScot)	262.2 (Aug 21)	2122.3 (Aug 22)	1,192.4
Fulmar	Breeding season (NatureScot)	97.5 (Aug 21)	68.1 (Jul 23)	82.8
	Non-breeding season (NatureScot)	202.9 (Jan 22)	98.2 (Oct 22)	150.6
	Spring migration (BDMPS)	202.9 (Jan 22)	73.4 (Mar 23)	138.2
	Autumn migration (BDMPS)	12.2 (Oct 21)	98.2 (Oct 22)	55.2
	Winter (BDMPS)	86.9 (Nov 21)	18.2 (Nov 22)	52.6
Gannet	Breeding season (NatureScot)	460.6 (Jul 21)	384.7 (Sep 23)	422.7
	Non-breeding season (NatureScot)	93.9 (Mar 22)	184.8 (Feb 23)	139.4
	Spring migration (BDMPS)	93.9 (Mar 22)	184.8 (Feb 23)	139.4
	Autumn migration (BDMPS)	125.7 (Sep 21)	177.5 (Sep 22)	151.6

11.8.7 Adult Regional Breeding Population Sizes

64. Full details of the process for determining adult regional breeding population sizes are presented in **Technical Appendix 11.2: Baseline Site Characterisation: Annex 11.2M: Regional Breeding Adult Population Estimates**.

65. Populations of breeding adults at colonies in Britain and Ireland were calculated by summing the most recent colony counts collated in the 4th National Seabird Census 'Seabirds Count' between 2015 and 2021 (Burnell et al., 2023). The Seabirds Count dataset is available from the JNCC website (Version last updated July 2024[3]).

66. Breeding adult regional population sizes were estimated by summing seabird colony counts recorded at all sites within an 'at-sea' (i.e. diverting around land) recommended species-specific foraging range from the WDA plus 2 km buffer. **Table 11.10** shows distances and foraging range units for each species as presented in NatureScot Guidance Note #3 and based on Woodward et al. (2019).

Table 11.10 Foraging ranges used for identifying seabird colonies to include in the breeding season population size, as advised in the current NatureScot Guidance Note #3.

Species	NatureScot recommended Foraging Range (km)	Metric**
Arctic tern	40.5	MM+SD
Common tern	26.9	MM+SD
Fulmar	1200.2	MM+SD
Gannet	509.4	MM+SD
Gannet (Forth Islands SPA)*	590.0	Max

[3] Seabird Count Datasets 2023 updated July 2024: Seabirds Count Datasets | JNCC Resource Hub

Species	NatureScot recommended Foraging Range (km)	Metric**
Gannet (Grassholm SPA)	516.7	Max
Gannet (St Kilda SPA)	709.0	Max
Great black-backed gull	73.0	Max/MM
Guillemot (for all colonies except those in the Northern Isles)	95.2	MM+SD
Guillemot (all Northern Isles colonies)*	153.7	MM+SD
Herring gull	85.6	MM+SD
Kittiwake	300.6	MM+SD
Razorbill (all colonies except those in the Northern Isles)	122.2	MM+SD
Razorbill (all Northern Isles colonies)*	164.6	MM+SD
Puffin	265.4	MM+SD

** not applicable – relevant colonies are beyond foraging range of the WDA plus 2 km buffer.*

*** Metric: Mean-Maximum (MM), Maximum (Max), Standard Deviation (SD)*

67. NatureScot advised at ETG Meeting 2 (ETG 2, 23 January 2024) that some new colony counts may be available since the 4th National Seabird Census Seabirds Count (2015 – 2021) data were published. The online SMP database (available online on 23 September 2025) was therefore searched to provide any relevant updated colony counts recorded between 2022 and 2025.

68. Once the list of breeding colonies within foraging range had been selected, the total numbers of individual adult birds were calculated for each species as follows:

- For species recorded in paired count units i.e. Apparently Occupied Nests (AON); Apparently Occupied Sites (AOS) and Apparently Occupied Burrows (AOB) the colony count was multiplied by two to calculate the total number of adult individuals;
- For guillemot and razorbill which were recorded in count units of individuals, the colony count was first multiplied by 0.67 and 0.75, respectively, to calculate the number of adult pairs (based on Harris, 1989 in Burnell et al*.,* 2023) and then multiplied by two to calculate the total number of adult individuals; and,
- For each species, colony counts were summed to produce the number of individual adults present at all colonies within species-specific foraging ranges.

69. Total numbers of individuals, including sabbatical adults and all sub-adult ages, were calculated based on the estimated proportion of adults and the proportion of sabbatical birds within the species' population.

70. Sabbatical rates used are those agreed with NatureScot for the West of Orkney Offshore Windfarm, with the exception of herring gull where the sabbatical rate was obtained from Calladine and Harris (1997). As agreed with NatureScot at the ETG Meeting 4 (ETG 4, 2 December 2025), the proportion of adult birds was taken from the stable age structure, as used in the BDMPS report (Furness, 2015).

71. The breeding season regional population estimates for pairs, individual numbers of adult birds, and all birds (accounting) are presented in **Table 11.11**.

Table 11.11 Breeding season population estimates within foraging range of the WDA plus 2 km buffer.

Species	Total pairs (census unit)	Total adult individuals	Total all individuals
Arctic tern	734 AON	1,468	2,330
Common tern	21 AON	42	70
Fulmar	333,303 AOS	666,606	1,075,171
Gannet	140,166 AOS	280,332	566,327
Great black-backed gull	468 AON	936	3,273
Guillemot	194,734 IND	260,944	492,254
Herring gull	3,251 AON	6,502	20,840
Kittiwake	48,683 AON	97,366	204,122
Puffin	231,098 AOB	462,196	903,609
Razorbill	49,546 IND	74,319	140,198

11.8.8 Non-Breeding Season BDMPS

72. In the non-breeding season, the regional population size can be determined from the relevant BDMPS for each species (Furness, 2015). For most species, the Project is within UK Western Waters (± Channel) BDMPS Region.

73. The BDMPS approach provides estimated population sizes for a variety of seasons within the overall non-breeding season. The BDMPS seasons divide the non-breeding season defined by NatureScot into multiple seasons, depending upon the species being considered. Since NatureScot guidance does not divide the non-breeding season into multiple seasons, it is necessary to compare the predicted impacts on the regional population to each seasonally defined BDMPS population size.

74. The combination of predicted impact and BDMPS seasonal population that has the largest impact on adult survival is used as the most precautionary assessment of the significance. BDMPS populations for each species, region and season that are likely to be relevant are summarised in **Table 11.12.** Note that European storm-petrel was not assessed by Furness (2015) but as this species is migratory and was not recorded in the non-breeding season from DAS results, the absence of a non-breeding population scale is not relevant.

75. Guillemot and herring gull are the exceptions to this, where the same foraging range information used in the breeding season will be applied in the non-breeding season under the assumption that breeding birds of these species spend all year in the broad vicinity of the colonies.

Table 11.12 Biologically defined minimum population scale regions and seasons for key species (from Furness, 2015)

Species	Biologically Defined Minimum Population Scale (BDMPS) Season and Region	Adult population (individuals)
Kittiwake	Autumn migration (August to December) in 'UK western waters and Channel'	498,970
	Spring migration (January to April) in 'UK western waters and Channel'	375,711
Great black-backed gull	Non-breeding season (September to March) in 'UK west of Scotland waters'	14,238

Species	Biologically Defined Minimum Population Scale (BDMPS) Season and Region	Adult population (individuals)
Common tern	Migration seasons (late July-early September and April-May) in 'UK western waters'	40,216
Arctic tern	Migration seasons (July-early September and late April-May) in 'UK western waters'	48,538
Razorbill	Migration seasons (August to October, and January to March) in 'UK western waters'	316,928
	Winter (November and December) in 'UK western waters'	179,183
Puffin	Non-breeding season (mid-August to March) in 'UK western waters'	249,896
Great northern diver	Non-breeding season BDMPS (September to May) in 'West of Scotland'	2,000*
Fulmar	Winter (November) in 'UK western waters and Channel'	363,383
	Migration seasons (September and October, December to March) in 'UK western waters and Channel'	490,041
Manx shearwater	Migration seasons (August to early October, late March to May) in 'UK western waters and Channel'	992,300
Gannet	Autumn (September to November) in 'UK western waters'	318,001
	Spring (December to March) in 'UK western waters'	391,540
* Adults and immatures		

76. To estimate non-breeding season impacts appropriate for each species' regional population, the regional populations (**Table 11.11**) were divided by respective BDMPS non-breeding season populations (**Table 11.12**) to obtain the proportion of the non-breeding season impact to apportion to the regional population. Thus, annual mortalities assessed against regional populations were calculated as the sum of the total breeding season estimate and the apportioned non-breeding season estimates. See **Technical Appendix 11.7: PVA** for more details.

11.8.9 Migratory Species

77. In addition to hosting internationally important populations of breeding seabirds, UK waters are an important migratory flyway for waterbirds during the non-breeding season. These species may interact with offshore windfarms during spring and autumn migrations, but also during moult migration or in response to cold weather movements. In addition to waterbirds, significant numbers of raptors may migrate through UK waters.

78. NatureScot Guidance Note #7 on assessing collision risk of marine birds contains a short section on non-seabird migratory SPA species, which include swans, geese, divers, seaduck and raptors. The occurrence of such species within the Study Area may be under-recorded during baseline surveys because of the short duration they are present, and/or movements occurring during the hours of darkness.

79. Guidance Note #7 advises that the Scottish Government's strategic study of collision risk for birds on migration (Woodward et al., 2023) should be used alongside the accompanying migratory sCRM. The Woodward et al. (2023) review determines potential migratory routes undertaken by non-seabird migratory species, using ringing recoveries, and for some species, high-definition tracking data. Out of the 70 species analysed by Woodward et al. (2023), 55 have broad migratory routes which overlap

with the location of the Study Area off the west coast of Scotland and therefore are at theoretical risk of collision with operational WTGs.

80. The migratory sCRM was run for these species and results are presented in **Annex 11.3D: Migratory Collision Risk Modelling**. Greenland white-fronted goose which winter on Islay were assessed separately (at the request of NatureScot) **Annex 11.3C: Collision Risk Modelling of Greenland White-Fronted Goose**. Predicted annual collision mortality for all migratory species is extremely low in both absolute and proportional terms (this is described in Impact 5, **Section 11.11.1.8**).

81. During consultation, RSPB Scotland highlighted the potential for the Project to impact the wintering population of Greenland white-fronted goose on Islay, as the population on both Islay and internationally is small and declining (**Table 11.2**). Since there remains a degree of uncertainty about migration routes, in addition to the migratory sCRM for the species, a second assessment was conducted under a precautionary assumption that all of the Islay population of Greenland white-fronted geese could pass through the WDA on migration (i.e. twice per year) at collision risk height (i.e. all of the Islay population could be at risk of collision). While this is an unrealistic, worst case scenario, it provides context to the results obtained from estimating the passage rate as the Project's proportion of the migration corridor, as applied within the migratory sCRM tool.

82. Using the peak spring count of 6,878 birds from Islay as the input to the migratory sCRM and assuming 100% of these birds flying through the WDA twice per annum, all at collision risk height, the predicted annual collision rate was up to 0.098. The mean adult annual survival rate for white-fronted goose on Islay is 0.828 (Griffin et al., 2020), with a predicted collision estimate of 0.098 birds per annum, the resultant percentage point change in annual adult survival rate is 0.001%. The change in adult survival rate due to predicted collision estimates for both the mCRM and precautionary CRM models did not exceed the 0.02% threshold and therefore no further assessment, such as PVA would normally be required (as stated in NatureScot Guidance Note #11). However, due to concern about this sensitive and declining population, NatureScot requested a PVA be undertaken. The worst case impact generated a counterfactual of population size (C-PS) after 35 years of 0.9979 (**Annex 11.3C: Collision Risk Modelling of Greenland White-Fronted Goose)**. This indicates that even under the highly precautionary assumption that all of this population flies through the WDA at collision height twice each year, the population will only be 0.21% smaller after 35 years. This equates to 15 individuals from the current population of 6,878. Such a small reduction would be undetectable and it can therefore be concluded that there is no risk of WDA-alone impacts having a significant effect on the Islay wintering Greenland white-fronted goose population.

11.8.10 Predicted Future Baseline

83. For seabirds, trends in breeding populations are better known and better understood than trends in numbers at sea. Breeding numbers are regularly monitored at many colonies, and in the British Isles there have been four comprehensive censuses of breeding seabirds in 1969-70, 1985-88, 1998-2002 (see Mitchell et al., 2004), and 2015-2021 (Burnell et al., 2023) as well as single-species surveys (such as the decadal counts of breeding gannet numbers (Murray et al., 2015). In contrast, the European Seabirds at Sea (ESAS) database is incomplete, and relatively few data have been added since 2000, so that current trends in numbers at sea in areas of the North Sea are more difficult to assess.

84. Results of the most recent UK seabird census (Burnell et al., 2023) have shown that 11 of the 21 seabird species, where there is sufficient confidence in trends, have declined by over 10% since the previous census in 1998-2002 (Mitchell et al., 2004). This includes kittiwake and great black-backed gull. The breeding populations of five species (including gannet and razorbill) have increased by over 10% and a further five (including guillemot) have remained stable. These trends in British seabird populations seem likely to continue in the short to medium term, although for some species such as

gannet, which has notably been susceptible to the effects of HPAI (e.g., Pearce-Higgins et al., 2023; Tremlett et al., 2024), the long-term impact on the population trend is currently unclear, albeit there is some preliminary evidence that gannets revealed specific immunity showing exposure and recovery in a proportion of birds (Lane et al., 2024) and that reproductive success was not affected by previous exposure (Lewis et al., 2026; Ponchon et al., 2026). Great skua has also suffered particularly high mortalities due to HPAI, with Tremlett et al. (2024) finding that the number of great skua territories recorded in 2023 across all sites surveyed declined by 76% compared with the pre-HPAI baseline count. This has reversed an otherwise generally positive trend in numbers between censuses and again, long-term impacts are unclear.

11.8.10.1 Drivers of Change

85. Burnell et al. (2023) identified that the main drivers for declining breeding seabird populations in the UK are climate change and predation by native and invasive predators. Adverse weather conditions potentially associated with climate change affect nesting and foraging, and increased water temperatures reduce the availability of sandeels and other prey species. These impacts are exacerbated by fish stock depletion by commercial fisheries, resulting in depleted food resources during the breeding season.

86. There are also many other smaller pressures affecting particular species of seabirds which may contribute to baseline conditions changing in the North Sea.

87. In individual studies, key drivers of seabird population size in western Europe have been identified as climate change (Sandvik et al., 2012; Frederiksen et al., 2004, 2013; Burthe et al., 2014; Macdonald et al., 2015; Furness, 2016; JNCC, 2016; Pearce-Higgins, 2021), 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 local factors (Ratcliffe, 2004; Votier et al., 2004, 2008; JNCC, 2016). Since 2021, HPAI has adversely affected survival and productivity within seabird colonies across the UK, and investigations are underway to determine the long-term effects on species' populations, combined with the other pressures (see e.g., Pearce-Higgins et al., 2023).

88. Pearce-Higgins (2021) assessed the impact that climate change has already had on UK bird populations by relating their long-term trends to separately published species' responses to climate change, temperature and rainfall. It was found that of the 20 seabird species found in the UK, 14 are regarded as being at high or medium risk of negative climate change impacts. Documented declines in sandeel populations have led to reduced breeding success in seabirds, and at least partially underpin long-term population declines (Johnston et al., 2021).

89. Prior to the Seabirds Count 2015-21 results being published, there was already good evidence that kittiwake, Arctic skua, puffin and fulmar are being affected by climate processes (Frederiksen et al., 2004, Burthe et al., 2014, Cook et al., 2014, Perkins et al., 2018).

90. Fisheries management is also likely to influence future numbers in seabird populations. The Common Fisheries Policy Landings Obligation ('discard ban') will further reduce 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.

91. 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 ‘forage fish’ such as sandeels (Frederiksen et al., 2007; Macdonald et al., 2015). Lindegren et al. (2018) concluded that sandeel stocks in the North Sea, the most important prey fish stock for North Sea seabirds during the breeding season (Furness and Tasker, 2000), have been depleted by high levels of fishing effort. These stocks are unlikely to recover fully even if fishing effort was reduced, because climate change has altered the North Sea food web to the detriment of productivity of fish populations. (e.g. Dulvy et al., 2008; Hiddink et al., 2015). As a result of climate-driven changes to plankton abundance and timing of availability, and the knock-on effect this has on sandeel and other forage fish populations, seabird populations are likely to continue to experience food shortages in the North Sea, especially for those species most dependent on sandeels as food.

11.8.10.2 Species Threats

92. In relation to the scoped in seabird IOFs, 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, Searle et al., 2023). The species has lost the opportunity to feed on fishery discards since the Landing Obligation came into effect in 2019.

93. Gannet numbers may continue to increase for some years, but evidence suggests that this increase is already slowing (Murray et al., 2015), which may be exacerbated by HPAI impacts. Tremlett et al. (2024) found that gannets suffered large declines between the pre-HPAI baseline and 2023 counts at several important colonies distributed across the UK range and postulated that the declines at most sites are likely to be worse than indicated, owing to the previously increasing population and the length of time since the baseline counts were made.

94. Whilst the Landings Obligation will have reduced 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). The flexible behaviour and diet of gannets probably reduce their vulnerability to changes in fishery practices or to climate change impacts on fish communities (Garthe et al., 2012).

95. 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). Tern species recorded large declines in 2023 due to HPAI impacts, whereas guillemot trends were much more variable between colonies (Tremlett et al., 2024). Strong declines in shag numbers are likely to continue as they are adversely affected by climate change, and especially by stormy and wet weather conditions in winter (Burthe et al., 2014; Frederiksen et al., 2008). Howells et al. (2018) has found evidence of a large reduction in the proportion of diet comprising sandeels for shags on the Isle of May, Scotland, suggesting that substantial temporal changes in prey populations have occurred, which may have important implications for seabird population dynamics.

96. A long-term decrease in numbers of great black-backed gulls breeding in the north of Scotland (Moffat et al., 2020), and the enforcement of the Landings Obligation will probably result in further decreases in numbers of north Norwegian great black-backed gulls, and herring gulls, coming to the North Sea in winter. Great black-backed gulls also showed a widespread decline in 2023 compared to pre-HPAI baseline (Tremlett et al., 2024).

97. It is likely that further redistribution of breeding herring gulls will occur into urban environments (Rock and Vaughan, 2013), although it is unclear how the balance between terrestrial and marine feeding

by these gulls may alter over coming years; that may depend greatly on the longer-term consequences of Brexit for UK fisheries and farming.

98. Some of the human impacts on seabirds are amenable to effective mitigation (Ratcliffe et al., 2009; Brooke et al., 2018), but the scale of efforts to reduce these impacts on seabird populations has been small by comparison with the major influences of climate change and fisheries. This is likely to continue to be the case in future, and the conclusion must be that with the probable exception of gannet, numbers of almost all other seabird species in northern UK regions will most likely be on a downward trend over the next few decades, due to population declines, redistributions or a combination of both.

99. For offshore ornithology, the ecological impact assessment is therefore carried out in a context of ongoing declines for most species. Where a species is declining, the assessment takes into account whether a given impact is likely to exacerbate a decline in the relevant reference population and prevent a species from recovery should environmental conditions become more favourable.

100. Climate change has been identified as the strongest influence on future seabird population trends. In this context it is noted that a key component of global strategies to reduce climate change is the development of low-carbon renewable energy developments such as offshore windfarms.

11.8.10.3 Highly Pathogenic Avian Influenza

101. NatureScot advised during consultation (**Table 11.2**) that there is a need for ongoing engagement in relation to the impacts of HPAI and how to incorporate these impacts within the assessment. Work is continuing within NatureScot to provide further information and guidance.

102. A discussion on the impacts that HPAI may have had on the reliability of baseline DAS data was presented in the West of Orkney offshore windfarm Additional Information, Appendix 1 - EIA and HRA: Baseline Site Characterisation Technical Report, with further details in Annex 1P: *Seabirds and Highly Pathogenic Avian Influenza: a review*. A summary of the conclusions of data suitability is presented here.

103. Mortality linked to the current HPAI virus outbreak was first reported among seabirds breeding on Scottish islands in July 2021 (Banyard et al., 2022). In 2022 and 2023, the HPAI virus adversely affected survival and productivity within a host of different seabird colonies across the UK (NatureScot, 2023j; Tremlett et al., 2024). The HPAI virus has been found to affect a range of seabird species, particularly great skua and gannet.

104. Natural England (2022) stated that "*We expect seabird data collected prior to summer 2022 (June) to remain a valid representation of 'typical' seabird distribution and density, as this was before mass mortality events began to take place*." Baseline DASs for the Project were undertaken from March 2021 to September 2023 and therefore if this advice was also applied in Scotland the first year of data, as a minimum, would provide a valid representation of typical seabird distribution and density prior to HPAI impacts.

105. The NatureScot Scientific Advisory Committee Sub-Group on Avian Influenza report (NatureScot, 2023j) noted that, during the period 4 April to 11 September 2022, 20,500 dead seabirds were reported with gannets and great skuas being the most badly affected species but also guillemots, kittiwakes, terns and large gulls. Great skua were detected early on as having HPAI, whereas kittiwake and fulmar were not reported until later on in the season.

106. Given that HPAI was noted in great skuas on Orkney in 2021, with the first mortalities occurring in June 2021 (Banyard et al., 2022), and also given the substantial mortality rate (NatureScot, 2023j) and declines in great skua populations (Tremlett et al., 2024), it is likely that DAS data in the WDA plus 4 km buffer were representative of great skua abundance and density in the presence of HPAI

impacts. For other species, for which impacts were more obvious in 2022, particularly later in that breeding season (NatureScot, 2023j), it is likely that the Project's DAS results are more representative of pre- and during-HPAI seabird distributions, densities and abundances.

107. For the purposes of this assessment, reference populations used have been estimated from Seabirds Count datasets (updated July 2024) collected before, during or after the widespread effects of HPAI on seabirds in 2022 and 2023 (see **Annex 11.2M: Regional Breeding Adult Population Estimates).** Therefore, because the baseline DAS data were also collected prior to and during the outbreak, the predicted magnitudes of impacts on seabird populations should remain reasonably consistent with current populations. Consequently, no adjustments to account for impacts of HPAI on populations are considered necessary for the assessment.

11.8.11 Data Limitations and Assumptions

108. The marine environment is highly variable, both spatially and temporally. The baseline characterisation for this assessment is based on 30 months of DAS data which are considered to be representative of the Study Area for the purpose of impact assessment. This has been agreed with NatureScot during the consultation process summarised in **Section 11.3**.

11.9 EMBEDDED MITIGATION MEASURES

109. This section outlines the embedded mitigation relevant to the offshore ornithology assessment (**Table 11.13**). Where additional mitigation measures are required to mitigate potentially significant effects (in EIA terms), these are detailed in the impact assessment.

Table 11.13 Embedded mitigation measures for offshore ornithology

ID	Mitigation Measure	Description	Securing Mechanism
M-4	Environmental Management Plan	Development of, and adherence to, an Environmental Management Plan (EMP) which will be in accordance with **Appendix 6 Outline EMP** submitted with the application for section 36 consent and marine licences. The EMP will include measures for preventing wastewater discharges from vessels and procedures for informing Project personnel on best practice guidance to reduce the potential for water discharges during offshore construction and O&M. The Outline EMP also describes current good practice for all construction and O&M vessel activities to be adopted in vessel transit corridors to mitigate disturbance of seabirds. This includes that indicative vessel transit corridors are routed to avoid passing through all marine SPAs including marine components of terrestrial breeding seabird SPAs. Indicative transit corridors have also been routed to be as distant as possible from marine SPAs with wintering waterbird features, which are particularly sensitive to vessel disturbance. In addition, the Outline EMP also provides an overview of protocols that will be built into the construction and operational phases for monitoring, recording and handling of any birds	Section 36 and marine licence consent conditions. Secured via **Appendix 6 Outline EMP**.

ID	Mitigation Measure	Description	Securing Mechanism
		attracted to lighting on offshore windfarm infrastructure or vessels. Bird handling protocols include information on: 1) How to manage lights on vessels and infrastructure to prevent birds landing: • Minimize the external visibility of interior lighting (e.g. through use of blinds) • Reduce/remove unnecessary external lighting sources 2) How to react if a bird is stranded on a vessel or part of infrastructure: • Keep records of the bird (including ID photos, date, location and weather conditions). • Release all unharmed birds immediately after recording details and taking photos • If a bird is stunned or injured, hold the bird in a single, breathable box in a cool dark place until it is recovered. • Inform authorities (e.g. local bird rescue group) to arrange pickup of any birds that are not fit to be released at sea. 3) What to do if authorities cannot pick up a bird within a 24h time period: • Release the bird, regardless of injuries, to a suitable undisturbed location on board or on the asset.	
M-6	Piling Noise Mitigation Plan	JNCC (2010) guidelines for minimising the risk of injury to marine mammals from piling noise and JNCC guidance for the use of Passive Acoustic Monitoring in UK waters for minimising the risk of injury to marine mammals from offshore activities are outlined in Section 4 of **Appendix 9 Draft Marine Mammal Mitigation Protocol (MMMP)** submitted with the application. A Piling Noise Mitigation Plan will be developed in the preconstruction phase in accordance with Section 4 of **Appendix 9 Draft MMMP**.	Section 36 and marine licence consent conditions. Secured via **Appendix 9 Draft MMMP** which sets out the requirements for a Piling Noise Mitigation Plan.
M-7	Marine Pollution Contingency Plan	Development of, and adherence to, a Marine Pollution Contingency Plan (MPCP). The MPCP will provide guidance to the Project personnel, contractors and subcontractors on the actions and reporting requirements in the event of spills and collision incidents. The MPCP will also contain emergency plans and mitigation procedures for a range of potential marine pollution incidents.	Section 36 and marine licence consent conditions. Secured via **Appendix 7 MPCP**.
M-11	UXO Clearance	A detailed MMMP based on JNCC (2025) guidelines for minimising the risk of injury to	Mitigation will be secured in the UXO MMMP as part of a separate

ID	Mitigation Measure	Description	Securing Mechanism
		marine mammals from UXO clearance and Defra (2025) guidance on minimising environmental impacts from UXO clearance, will be included in the Final MMMP prepared for UXO clearance during the pre-construction phase. The Final MMMP will accord with **Appendix 9 Draft MMMP** submitted with the application. This will ensure there are adequate mitigation measures to minimise the risk of any physical or permanent auditory injury to marine mammals from UXO clearance. Following the latest guidance, low order clearance will be the default method. The Draft MMMP for UXO clearance is presented in Section 3 of **Appendix 9 Draft MMMP**.	Marine Licence application submission prior to construction.
M-13	Site selection	The WDA avoids any overlap with designated sites (SPAs or Ramsar sites) for birds.	Secured within the Location Plan submitted alongside the Generation and Transmission Marine Licence Applications.
M-30	Blade Tip Clearance / Air Gap	Blade tip clearance height / Air Gap of at least 28.42 m above Highest Astronomical Tide (HAT), noting this exceeds Marine Guidance Note (MGN) 654 requirements. A higher blade clearance reduces the number of birds likely to be flying at rotor swept height and so decreases potential collision mortality.	Compliance with MGN 654 is a standard Section 36 and marine licence consent condition (typically captured under NSP condition) and secured under project design.
M-46	Decommissioning Programme	The development of, and adherence to, a Decommissioning Programme approved by Scottish Ministers prior to construction and updated throughout the Project lifespan.	Section 36 and marine licence consent conditions. Secured via a Decommissioning Programme, which will be developed and submitted to Scottish Ministers for approval before commencement of construction.
M-53	Lighting	Excess lighting, above levels set by regulatory requirements for navigation, aviation, escape/emergency procedures and general activity, will be avoided wherever possible. External general lighting will use methods to reduce excessive lighting of the WTGs and OSPs.	Section 36 and marine licence consent conditions. Secured via **Appendix 12 Outline Lighting and Marking Plan**.

11.10 APPROACH TO ASSESSMENT

110. As noted above, due to the delay in the confirmation of the Project’s grid connection location, this topic chapter considers the WDA Study Area and existing environment only. A combined assessment of the construction, O&M and decommissioning of the WDA activities, Offshore ECC and OnTDA activities (commensurate with the level of detail that is available at the time of carrying out that assessment) is also provided and the methodology for this is described in **Section 11.10.2**. This approach will ensure a holistic view is undertaken of the entire Project.

11.10.1 Windfarm Development Area-Alone

11.10.1.1 Methodology

111. **Chapter 5 EIA Methodology** provides a summary of the general impact assessment methodology applied in this WDA EIAR. The assessment for offshore ornithology has been undertaken following the principles of the conceptual 'source-pathway-receptor' model, tailored to make it applicable to offshore ornithology and aligned with the key guidance document produced on impact assessment of ecological/ornithological features (CIEEM, 2022). The model identifies potential impacts resulting from the proposed activities on the environment and sensitive features within it.

112. The parameters of the 'source-pathway-feature' approach are defined as follows:

- Source – the origin of a potential impact (noting that one source may have several pathways and features), e.g. an activity such as WTG installation and a resultant effect such as the presence of a new WTG structure in the offshore environment;
- Pathway – the means by which the impact of the activity could affect an IOF, e.g. for the example above, presence of a WTG could potentially cause a collision risk; and
- Features – as per CIEEM (2022) guidance, can be defined as the element of the receiving environment that is impacted, e.g., bird species foraging within or passing through the WDA.

113. The sensitivity of the feature is combined with the magnitude of impact to determine the effect significance. Sensitivity and magnitude criteria are assigned based on professional judgement, as described below.

114. It should be noted that although sensitivity is a core component of the assessment, conservation status is also taken into account in determining each potential impact's significance of effect. The conservation status of ornithological features is based on the population from which individuals are predicted to be drawn. This can vary through the year depending on the relative sizes of the number of individuals predicted to be at risk of impact and the reference population.

11.10.1.1 Definitions

115. For each potential impact, the assessment identifies receptors sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors. The definitions of sensitivity and magnitude for the purpose of the offshore ornithology assessment are provided in **Table 11.14** and **Table 11.15**.

116. It should be noted that although sensitivity is a core component of the assessment, conservation value (as defined in **Table 11.7**) is also taken into account in determining each potential impact's significance. Furthermore, high conservation value and high sensitivity are not necessarily linked within a particular impact. A receptor could be categorised as being of high conservation value (e.g. an interest feature of a SPA) but have a low or negligible physical / ecological sensitivity to an effect and vice versa. Determination of potential impact significance takes both of these into consideration. The narrative behind the assessment is important here; the conservation value of an ornithological receptor can be used where relevant as a modifier for the sensitivity (to the effect) already assigned to the receptor.

Table 11.14 Definition of sensitivity for ornithological receptors

Sensitivity	Definition
High	Bird species has very limited tolerance of sources of impact.
Medium	Bird species has limited tolerance of sources of impact.
Low	Bird species has some tolerance of sources of impact.
Negligible	Bird species is generally tolerant of sources of impact.

117. The definitions of the magnitude levels for ornithology receptors are set out in **Table 11.15**. This set of definitions has been determined on the basis of changes to bird populations.

Table 11.15 Definition of magnitude of effect

Magnitude of Effect	Definition
High	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that is predicted to irreversibly alter the population in the short-to-long term and to alter the long-term viability of the population and / or the integrity of the protected site. Recovery from that change predicted to be achieved in the long-term (i.e. more than five years) following cessation of the Project activity.
Medium	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that occurs in the short and long-term, but which is not predicted to alter the long-term viability of the population and / or the integrity of the protected site. Recovery from that change predicted to be achieved in the medium-term (i.e. no more than five years) following cessation of the Project activity.
Low	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that is sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. Recovery from that change predicted to be achieved in the short-term (i.e. no more than one year) following cessation of the Project activity.
Negligible	Very slight change from the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. Recovery from that change predicted to be rapid (i.e. no more than circa six months) following cessation of the Project related activity.
No Change	No loss of, or gain in, size or extent of distribution of the relevant biogeographic population or the population that is the interest features of a specific protected site.

11.10.1.2 Significance of Effect

118. The potential significance of effect for a given impact is a function of the overall sensitivity and the magnitude of the impact (see **Chapter 5 EIA Methodology** for further details). A matrix is used (**Table 11.16**) as a framework to determine the significance of an effect. Definitions of each level of significance are provided in **Table 11.17**. Impacts and effects may be either positive (beneficial) or negative (adverse).

119. In applying this methodology, professional judgement contributes to concluding significance of effects. This judgement draws on the assessor's technical expertise, knowledge of the receiving environment, and understanding of how similar developments have influenced comparable receptors. Judgement also considers the quality and confidence of the available data (**Section 11.8.11**), the level of uncertainty associated with predicted impacts, and any relevant

guidance or industry standards. Professional judgement ensures that the matrix outputs are interpreted in context, allowing the assessor to account for site-specific conditions, receptor sensitivities that may cut across criteria, and the nature of the predicted changes. This approach ensures that the determination of significance is robust, transparent and proportionate.

Table 11.16 Significance of effect matrix

Sensitivity	Adverse Magnitude				Beneficial Magnitude			
	High	Medium	Low	Negligible	Negligible	Low	Medium	High
High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
Medium	Major	Moderate	Minor	Negligible	Negligible	Minor	Moderate	Major
Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

120. It is important that the matrix (and indeed the definitions of sensitivity and magnitude) is seen as a framework to aid understanding of how a judgement has been reached from the narrative of each impact assessment. It is not a prescriptive formulaic method. Expert judgement has been applied to the assessment of likelihood and ecological significance of a predicted impact.

Table 11.17 Definition of significance of effect

Significance of Effect	Definition
Major	Very large or large change in receptor condition, which is likely to be an important consideration at a regional or district level because it contributes to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which is likely to be an important consideration at a local level.
Minor	Small change in receptor condition, which may be raised as a local issue but is unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No Change	No effect, therefore, no change in receptor condition.

121. For the purpose of the assessment of significance, the CIEEM (2022) guidance has been followed. This states that 'significance is a concept related to the weight that should be attached to effects when decisions are made so that the decision maker is adequately informed of the environment consequences of permitting a project'. CIEEM (2022) defines significance as follows: 'In broad terms, significant effects encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance, and distribution). Significant effects should be qualified with reference to an appropriate geographic scale, for example a significant effect on a Site of Special Scientific Interest is likely to be of national significance.'

122. Where possible, assessment is based upon quantitative and accepted criteria and/or methods (for example, guidance notes from NatureScot, SNCBs guidance on collision risk modelling (SNCB, 2024), and displacement (SNCB, 2017; updated 2022), and/or biological removal thresholds determined through population modelling), together with the use of value judgement and expert interpretation to establish to what extent an effect is significant.

11.10.2 Combined Assessment: Windfarm Development Area, Offshore ECC and Onshore Development Transmission Development Area Methodology

123. This section presents how the Applicant will assess interactions between the WDA, Offshore ECC and OnTDA (i.e. considering impact interactions and additive effects to determine if any effects would be materially elevated from those assessed for the WDA-alone assessment). The approach enables potential interactions between each Development Area to be identified and assessed, ensuring a whole Project assessment is undertaken in a manner that is meaningful and proportionate. This is referred to as the combined assessment.

124. In this context, interactions are considered where there may be spatial overlap of impacts and additive effects are considered where there may be incremental impacts on the same feature, including increased temporal impacts.

125. Worst-case scenarios for all WDA infrastructure (which includes OSPs, OSP link cables and up to 200 km of the offshore export cables which could be located within the WDA) has been incorporated into the worst-case scenario for the WDA-alone assessment (**Figure 11.1** and **Section 11.11.1**).

126. To inform the combined assessment, a set of assumptions were developed which includes a preliminary boundary for the Offshore ECC and OnTDA (connection point near Girvan, South Ayrshire), anticipated project components and associated construction methods and timelines. These are set out in **Chapter 3 Project Description**, Sections 3.7 and 3.8. Offshore and onshore engineering and environmental surveys enabling Offshore ECC and OnTDA corridor refinement are anticipated to take place after the WDA EIAR has been submitted to the consenting authorities.

127. Within the upcoming Offshore ECC and OnTDA consenting applications, their respective scoping and EIARs will take account of all likely effects predicted within the WDA EIA and present updated combined assessments using the latest available information covering all aspects of the Project.

128. **Section 11.11.2** includes a qualitative discussion where potential interactions and additive effects between the WDA and the Offshore ECC and OnTDA have been identified, with the aim of determining whether effects could result in those of greater significance than assessed for the WDA-alone assessment. To accompany the description, a combined assessment summary table is provided. Only residual effects from the WDA-alone assessment are taken forward for consideration in the combined assessment.

11.10.3 Cumulative Effects Assessment Methodology

129. The CEA considers the impacts arising from the activities and infrastructure associated with the whole-Project (i.e. the WDA, Offshore ECC and OnTDA) as well as cumulatively with other relevant plans, projects and activities. The general approach to the CEA for offshore ornithology includes identifying potential cumulative effects, identifying a short list of plans and projects for consideration and evaluating the significance of cumulative effects. **Chapter 5 EIA Methodology** provides further details on the general approach to the CEA.

130. In line with the methodology set out in **Chapter 5 EIA Methodology**, the CEA is considered in two main stages with stage 1 split into two steps:

- **Stage 1a**: Screening of Potential Cumulative Impacts;
- **Stage 1b**: Screening of other plans, projects and activities; and
- **Stage 2:** CEA.

131. Stage 1a involves the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as ‘impact screening’).

132. Stage 1b is the screening of other plans, projects and activities. In accordance with guidance documents discussed in **Chapter 5 EIA Methodology**, other plans or projects that are deemed likely to go ahead or are going ahead, and for which sufficient information is available to conduct a meaningful assessment, have been taken forward for consideration in **Appendix 5.1 Cumulative Projects Long and Short Lists**. If sufficient detail is not available, it is not possible to conduct a meaningful assessment of potential cumulative effects and therefore, these developments are not considered further. For the purposes of the CEA Long-List, the criteria of other plans or projects that are proposed for consideration include those which are 'reasonably foreseeable' such as those:

- Which have become operational since baseline data was collected;
- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined; and
- Plans and projects with design information in the public domain, including those that requested a Scoping Opinion up to six months prior to submission of the WDA application date as follows:
  - Projects in Scottish waters;
  - Projects in English, Welsh and Northern Irish waters, or other non-UK waters if considered to be relevant, have connectivity, or the potential for a cumulative effect;
  - Offshore wind projects granted an Option Agreement or Agreement for Lease; and
  - Non-wind projects.

133. The CEA Long-List has been developed based on the above criteria, and has been screened for each potential impact-receptor pathway using the following process:

- **Conceptual overlap**: an impact-receptor pathway describes an impact which has the potential to directly or indirectly affect the receptor(s) in question;
- **Physical overlap**: ability for impacts arising from the WDA, Offshore ECC and OnTDA to overlap with those from other plans or projects on a receptor basis. An overlap of the Zone of Influences (ZoIs) arising from the two (or more) projects/plans must be established for a cumulative effect to arise. There are exceptions to this for certain mobile receptors that are potentially subject to impacts from multiple plans or projects; and
- **Temporal overlap**: for a cumulative effect to arise from two or more plans or projects, a temporal overlap of impacts arising from each must be established. Some impacts are active only during certain phases of the WDA (e.g. piling noise during construction). However, the absence of a strict overlap may not necessarily mean there is no potential for cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects.

134. Stage 2 is the assessment of cumulative effects. For the assessment stage, information has been gathered based on the CEA Long-List (**Appendix 5.1**) of plans or projects taken forward from the screening stage. A tiered approach is used to provide a framework for placing relative weight on the potential for each plan or project to be included in the CEA, based on the plan's or project's current stage of maturity, certainty in the design or effects and overall availability of detail on which to carry out an assessment. Projects or plans that will be assessed in Stage 2 will use the following tiers:

- Tier 1 assessment: projects which are operational (but not part of the baseline), under construction, those with consent and those projects where an application has been submitted but not yet determined;
- Tier 2 assessment: all plans/projects assessed under Tier 1, plus those projects with a Scoping Report and/or Scoping Opinion; and
- Tier 3 assessment: all plans/projects assessed under Tier 1 and Tier 2, plus those projects likely to come forward where a Crown Estate Scotland (CES) Option to Lease Agreement or equivalent has been granted (i.e., ScotWind and INTOG projects).

11.10.4 Transboundary Effects Assessment Methodology

135. The transboundary effect assessment considers the potential for effects to occur as a result of the WDA on offshore ornithology features within the Exclusive Economic Zone (EEZ) of other European Economic Area (EEA) member states or other interests of EEA member states. **Chapter 5 EIA Methodology** provides further details on the approach to the transboundary effect assessment.

136. For offshore ornithology, the potential for transboundary effects has been identified in relation to impacts associated with the Project on breeding and non-breeding seabirds originating from seabird colonies outside of the UK.

11.11 ASSESSMENT OF SIGNIFICANCE

11.11.1 Windfarm Development Area-Alone Assessment of Significance

137. The potential effects on offshore ornithology features that may occur during construction, O&M and decommissioning of the WDA are assessed in the following sections. The assessment follows the methodology set out in **Section 11.10** and is based on the realistic worst-case scenarios defined in **Section 11.7**, with consideration of embedded mitigation measures identified in **Section 11.9.**

138. This assessment has been undertaken on the basis of all embedded mitigation measures outlined in **Table 11.13**. The embedded mitigation measures relevant for each impact are listed in the summary **Table 11.98**.

11.11.1.1 Impacts Requiring Assessment

139. NatureScot Guidance Note #6 *Guidance to support Offshore Wind Applications: Marine Ornithology Impact Pathways for Offshore Wind Developments* identifies two key impact pathways for offshore wind energy: (i) collision risk with rotating WTG blades, leading to direct mortality; and (ii) distributional responses such as displacement and barrier effects, which is the effective loss of habitat or barriers to movement resulting in energetic stress to marine birds, which can have consequences on fitness including survival rates and productivity. These impacts can occur at any time of the year.

140. NatureScot also identifies a number of other impacts that may also arise from an offshore windfarm development and associated works, including changes to prey distribution, pollution and disturbance due to installation of export cables.

141. NatureScot has recommended the use of the FeAST tool[4], which provides sensitivities of marine bird species to different anthropogenic impacts, for identifying relevant literature on impact pathways for each feature. At the time of writing the tool was not fully functional for seabirds. Information was however provided on the following identified pressures on seabirds that may arise from Offshore Windfarm development:

- Barrier to species movement;
- Death or injury by collision below water;
- Physical change (to another seabed type). The permanent change of one marine habitat type to another marine habitat type, through the change in substratum, including to artificial (e.g. concrete mattresses, rock dumping);
- Sub-surface abrasion/penetration. Damage to species or habitats below the surface of the seabed;
- Synthetic compound contamination;

[4] https://feature-activity-sensitivity-tool.scot/

- Underwater noise. Anthropogenic sound sources that exceed levels that elicit a response from an individual, for example, in terms of movement away, or cessation of feeding (for disturbance), or exposure which leads to auditory injury;
- Water clarity changes;
- Water flow (tidal current) changes;
- Visual disturbance (behaviour); and
- Death or injury by collision above water.

142. These individual examples of impacts have been taken into consideration and have been assessed as part of wider impact pathways, e.g. indirect impacts on prey species, or disturbance.

143. Based on the review informed by NatureScot Guidance Note #6, and consultation summarised in **Table 11.2**, the impacts identified as requiring consideration for offshore ornithology are listed in **Table 11.18**. An overview of how each impact is assessed is also provided.

Table 11.18 Impacts requiring assessment for offshore ornithology.

Potential Impact	How is the Impact Assessed
Construction (including pre-construction) and decommissioning*	
Impact 1. Direct distributional responses and displacement	This impact considers a range of noise, visual or vibrational disturbance sources (construction activities, vessel movements, UXO clearance) and has been assessed qualitatively, with some contextual quantitative survey count information considered. The species considered susceptible to disturbance sources within the WDA were identified using SNCB (2017; updated 2022) guidance. Impacts outside of the WDA, associated with vessel routing to and from port are assessed separately.
Impact 2. Indirect disturbance and displacement of prey species	This impact has been assessed qualitatively, drawing on information from **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish**. It includes sources of impact identified above by the FeAST tool, such as temporary habitat loss and SSC increases and redeposition.
Impact 3. Artificial Construction Lighting	Semi-quantitative assessment based on a literature review summarised in the **RIAA** and presented in Furness et al. (2026). Nocturnally active Manx shearwater and European storm-petrel were assessed, as agreed with consultees.
Operation and maintenance	
Impact 4. Direct distributional responses, displacement and barrier effects	A screening exercise, agreed through consultation, identified species at potential risk to operational disturbance and displacement within the WDA. The displacement assessment followed the 'Matrix Approach' as advised by NatureScot and SNCB (2017; updated 2022). The full methodology for quantifying this impact is provided within **Technical Appendix 11.4: Displacement**. Impacts associated with vessel movements between port and the WDA have been assessed qualitatively, similar to the construction phase.
Impact 5. Collision risk	A screening exercise, agreed through pre-application consultation, identified species at potential risk of collision. The stochastic CRM tool (sCRM; Caneco, 2022) was used to estimate collision mortality. The full methodology is provided within **Technical Appendix 11.3: Collision Risk Modelling**.
Impact 6. Indirect habitat loss / change for prey species	This impact has been assessed qualitatively, drawing on information from **Chapter 8 Benthic Ecology and Chapter 9 Fish (Including Basking Shark) and Shellfish.** It includes sources of impact identified by the FeAST tool, such

Potential Impact	How is the Impact Assessed
	as permanent habitat loss, EMF and thermal impacts and introduction of hard substrates.
Impact 7. Artificial Operational Lighting	Semi-quantitative assessment based on a literature review summarised in the **RIAA** and presented in Furness et al. (2026). Nocturnally active Manx shearwater and European storm-petrel were assessed, as agreed with NatureScot.
Impact 8. Combined operational displacement and collision risk	A combined quantitative displacement and collision risk assessment uses the same methodologies as outlined above for Impacts 4 and 5.

** In the absence of detailed information regarding decommissioning works, and unless otherwise stated, the impacts during the decommissioning of the Project considered analogous with, or likely less than, those of the construction stage.*

11.11.1.2 PVA for Impacts Requiring Assessment

144. For full details of PVA methodology, see **Technical Appendix 11.7: PVA**.

145. Where a predicted impact can be estimated quantitatively, a PVA has been used to assess the effect on a species' appropriate breeding season reference population, in circumstances where the predicted change in adult survival due to that impact was 0.02% or larger (following NatureScot Guidance Note #11, and includes values when rounded up to two decimal places, as requested by NatureScot at the ETG Meeting 4 (ETG 4, 2 December 2025)).

146. The NE PVA tool (Searle et al., 2019) was used to assess population response to predicted impacts.

147. In all cases, PVAs have been run for 25, 35 and 50 years. NatureScot Guidance Note #11 advises presenting outputs from 25- and 50-year projects as well as the intended period of operation, which for the Project, is 35 years.

148. Following NatureScot Guidance Note #11, the two primary outputs from the PVA model which are used for interpreting population effects are the counterfactual of population growth rate (C-PGR) and the C-PS.

149. Although the two counterfactual measures may appear to be equally informative with respect to understanding the population consequences of impacts, which one is more appropriate depends on whether density dependent regulation has been included. Consideration of the properties of density dependent and density independent population projections illustrates why this is: a population regulated by density dependent feedback will maintain itself around an equilibrium level. Since there is no long-term growth or decline for such a population, when an impact is applied the population growth rate will only change in the short term, following which the population will once again settle at a new, lower, equilibrium size. Hence the change in growth rate (i.e. C-PGR) is of limited value for understanding the effect of an impact. In contrast, the change in population size (C-PS) provides useful information on how much smaller the population will be in the presence of the impact.

150. When a population is simulated without regulation (i.e. density independent), the population will grow or decline exponentially. The baseline and impacted predictions will both change in this manner but the difference between the two will increase with duration as the baseline population grows more rapidly. Hence, the time point when the differences are considered is critical to the C-PS value obtained and how this is interpreted. However, the average growth rate of a density independent population is constant and therefore, a comparison of the baseline and impacted growth rates is insensitive to the duration over which the comparison is made. Thus, for density independent PVA, as presented here, the C-PGR is the more robust and reliable metric to use.

11.11.1.3 Impacts Scoped Out of the Assessment

151. The following impacts have been scoped out of the assessment:

- Construction and decommissioning:
  - Collision risk with installed but not commissioned (or decommissioned) WTG and construction vessels.
- Operation and maintenance:
  - Ghost fishing; and
  - Collision risk with structures below the water.

11.11.1.4 Impact 1: Direct Distributional Responses and Displacement

11.11.1.4.1 Summary of Potential Impacts

152. The offshore construction stage of the WDA and associated infrastructure has the potential to disturb birds in the marine environment, leading to displacement from the area within and around construction activity. Construction would require the mobilisation of vessels and the installation of foundations, offshore export cables and other infrastructure (e.g., WTGs and OSPs). These activities could result in temporary reductions in the space, or time, available for foraging, loafing and moulting birds within the WDA, and construction vessel routes to and from port.

153. Causes of potential disturbance would comprise presence of construction vessels and associated activity, and above sea and subsea noise and vibration from construction activities associated with construction sites. Artificial lighting impacts are considered separately under Impact 3.

154. The principal source of noise and vibration during construction would be subsea piling works within the WDA associated with the installation of foundations for WTGs and offshore substation platforms; the maximum duration of piling within the WDA would be 768 hours, or 32 days for monopiles, and 1,976 hours or 82.3 days for pin-piles (**Table 11.5**).

155. UXO clearance also presents a potential noise disturbance risk to seabirds if detonations are required (as well as a possibility of direct mortality should birds be in close proximity to high-order detonations; however, this is highly unlikely since low-order clearance techniques will be used – see **Appendix 9 Draft MMMP**).

156. Due to the limited empirical evidence available showing the effect that noise disturbance alone has on wild marine birds, above water noise disturbance from construction activities is not considered in isolation as a risk factor for birds; but rather, combined with the visual presence of vessels, man-made structures, and human activity, part of the overall worst-case disturbance stimulus that causes birds to avoid boats and other structures. A separate assessment of subsea noise disturbance is however provided.

157. The Project's construction may last up to five years, under the assumption that construction activities would typically be undertaken 24 hours a day, seven days a week, dependent upon weather conditions.

158. Construction will not occur across the whole of the WDA simultaneously or every day and in all months of the year. Consequently, the impacts will occur only in the discrete areas where vessels are operating at any given point and not the entire WDA.

159. A range of vessels will be associated with construction of the Project, undertaking activities including UXO survey and intervention, dredging, piling and WTG installation, cable laying and rock/mattress protection placement. Other vessels will be required to transport personnel and infrastructure to the WDA and to support these vessels, e.g. tugs, supply vessels, etc. Most vessels associated with construction of the Project will spend most of the time in the WDA. During construction, certain

vessels will remain offshore for the entire season without entering any port and will therefore require regular servicing by offshore supply vessels. Other vessels will make regular port calls.

160. NatureScot's Guidance Note #8 (*Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds*), Guidance Note #4 (*Overview of connectivity to marine SPAs*) and Project-specific consultation advice have been the primary sources used to inform the scope of the assessment of the various construction disturbance impacts. This has been separated into impacts associated with (i) above sea disturbance within the WDA; (ii) subsea noise disturbance; and (iii) vessel movements to and from ports and the WDA.

11.11.1.4.2 Above Sea Disturbance

11.11.1.4.2.1 Screening of IOFs for Assessment

161. NatureScot Guidance Note #8 refers to Section 5 in the joint SNCB (2017; updated 2022) guidance note for considering whether an assessment of displacement is required for a particular species. In this SNCB guidance, it is recommended that consideration is given to each species observed within a development site, and is informed by:

- Species' presence at the development site; and
- Susceptibility to disturbance and habitat specialisation scores for species found in Scottish waters (Furness et al., 2013), and the expanded list for wider UK waters (Bradbury et al., 2014), covering additional species not previously included in Furness et al. (2013).

162. Both NatureScot and SNCB guidance advise that the priority species for assessment of displacement effects (assumed to refer to construction, operation and/or decommissioning) will typically be diver and seaduck species, guillemot, razorbill, puffin and gannet. Additionally, kittiwake is mentioned in Guidance Note #8 as a species requiring consideration for displacement impacts. Fulmar has generally not been assessed for displacement impacts in other Offshore Windfarm EIARs, however, for West of Orkney Offshore Windfarm NatureScot requested that fulmar is assessed for barrier effects. It is therefore included here in the assessment of construction disturbance on a precautionary basis.

163. Based on the guidance, the following nine seabird IOFs are considered for above sea disturbance impacts:

- Great northern diver;
- Kittiwake;
- Arctic tern;
- Common tern;
- Guillemot;
- Razorbill;
- Puffin;
- Fulmar; and,
- Gannet.

164. **Technical Appendix 11.4: Displacement** provides more detail on the rationale for scoping species in or out.

165. Although primarily concerned with O&M phase impacts (see Impact 4), these species are also considered appropriate for a qualitative assessment of construction impacts due to their apparent sensitivity to human-related disturbance, as described in the sources referred to above.

11.11.1.4.2.2 Sensitivity

166. Eight of the nine IOFs (kittiwake, Arctic tern, common tern, guillemot, razorbill, puffin, fulmar and gannet) are considered to have a **medium** sensitivity to disturbance and displacement, based on their sensitivity to ship and helicopter traffic noted in Garthe and Hüppop (2004), Furness and Wade (2012), Furness et al. (2013) and Bradbury et al. (2014). The determination of fulmar having a **medium** sensitivity is seen as precautionary, with low disturbance susceptibility and habitat specialisation scores given in SNCB (2022a) guidance.

167. Great northern diver is considered to be of **high** sensitivity to disturbance and displacement due to a high score for disturbance susceptibility and a moderate score for habitat specialisation (SNCB, 2022a).

11.11.1.4.2.3 Impact

168. As discussed above, impacts will occur only in the areas where vessel aggregations are operating at any given point and not across the entire WDA.

169. NatureScot's Guidance Note #8 is more readily relevant to operational phase impacts, although it can be used as a basis for determining possible worst-case magnitude of impact.

170. Recommended maximum displacement rates for each species (see **Table 11.20** under Impact 4) show that displacement rates within up to 2 km around a disturbance source are likely to vary widely between species, from 20% of fulmar individuals, to 80% for great northern diver (within up to 4 km).

171. If, during construction it is assumed that a species-specific displacement percentage is applied to birds within a 2 km radius (area of 12.57 km^2) of construction activity (e.g. an aggregation of vessels around a WTG under construction), then a rough indication of numbers of birds potentially affected can be estimated. Taking guillemot as an example of the species recorded in highest numbers, the mean peak density estimate across the annual period was 44.68 birds per km^2 (including apportioned unidentified auks and corrected for dive bias; see full details in **Technical Appendix 11.4: Displacement**). At this density, up to 561 individuals could be located with a 2 km radius of construction activity, of which, 60% (337 individuals) would potentially be temporarily displaced. Taking a precautionary approach and assessing against the adult breeding population, this would equate to 0.13% of the regional population (260,944 individuals).

172. Following this principle for all species, **Table 11.19** indicates that it is likely that a very small proportion of the population for each species would be affected by construction activities at any one time and considerably fewer individuals than across the whole WDA during operation (even if construction occurs simultaneously at more than one location within the WDA these would represent discrete areas of activity with multiple vessels in close proximity rather than being evenly distributed through the WDA).

173. It is reasonable to assume that displaced birds will reoccupy areas following construction cessation and so compared to long-term displacement during the operation phase, population level impacts on productivity or survival are much less likely to occur. Overall, therefore, it can be reasonably concluded that a **negligible** magnitude of impact would occur for all IOFs (including common tern, despite a low regional breeding population).

Table 11.19 Peak numbers of individuals across the annual cycle that may be subject to disturbance within 2 km of construction activity within the WDA, and peak proportion of adult population affected.

Species	Mean peak abundance (birds) sitting and flying within the WDA plus 2 km buffer	Peak density (birds/km2) sitting and flying within WDA plus 2 km buffer[1,2]	Peak individuals within 2 km radius of disturbance source (rounded to nearest integer)	Proportion displaced (%)	Number of individuals affected (rounded to nearest integer)	Breeding adult population (indiv.)	Proportion of breeding population within 2 km radius of disturbance source (%)
Arctic tern	91.4	0.14	2	50%	1	1,468	0.07
Common tern	62.8	0.10	1	50%	1	42	2.38
Fulmar	150.6	0.24	3	20%	1	666,606	0.0002
Gannet	422.7	0.66	8	70%	6	280,332	0.002
Great northern diver	16.2*	0.02*	0	80%	0	960**	0
Guillemot	28,531.5	44.68	561	60%	337	260,944	0.13
Kittiwake	5,654.4	8.86	111	30%	33	97,366	0.03
Puffin	1192.4	1.87	23	60%	14	462,196	0.003
Razorbill	6,951.4	10.89	137	60%	82	74,319	0.11

** within 4 km radius.*

*** Non-breeding season BDMPS (individual adults proportion (0.48; Furness 2015))*

[1] Area of WDA plus 2 km buffer = 638.55 km^2; area of WDA plus 4 km buffer = 852.78 km^2

[2] Great northern diver peak density calculated within the WDA plus 4 km buffer

11.11.1.4.3 Disturbance Associated with Subsea Noise

11.11.1.4.3.1 Screening of IOFs for Assessment

174. The FeAST tool identified that for marine birds, anthropogenic subsea sound sources that exceed levels may elicit a response from an individual, for example, in terms of movement away, or cessation of feeding (for disturbance), or exposure which leads to auditory injury.

175. Piling activity is generally identified as the main source of subsea noise from offshore windfarm construction that would potentially be at levels that would impact upon seabirds.

176. UXO clearance also presents a risk to seabirds both directly and indirectly during the pre-construction and construction phase. Detonation of UXOs may therefore temporarily disturb seabirds in their behaviours when foraging, or be a risk of injury or death.

177. The NatureScot report on *The Development of Marine Bird Sensitivity Assessments for FeAST* (Rogerson et al., 2021) highlighted pressures that marine bird species are highly sensitive to. The report identified that underwater noise may directly affect benthic and water column feeders, being submerged for comparable long periods when diving in search for prey on the seabed. The authors noted that although there could be direct effects of underwater noise on surface feeding birds, e.g.

fulmar or terns, as the bulk of their food is taken from the water surface any potential effect may be minor.

11.11.1.4.3.2 Sensitivity

178. The Scottish Government (2024) Scottish Seabird Vulnerability Report describes the process undertaken to identify the key pressures acting on seabirds in Scottish waters and at coastal breeding colonies. Subsea noise (both short duration and long duration) was not taken forward to the vulnerability analysis in the report, but sensitivity ratings (based on Rogerson et al., 2021) were provided for seabird species. Most species were identified as having a **low** sensitivity to subsea noise, with the exception of cormorant, shag and auk species, which were classified as 'sensitive'.

179. Guillemot was evaluated and classified as having a **medium** sensitivity (based on some evidence of consistent reactions to underwater sound during controlled trials), with the species submerging for comparably long periods when diving in search for prey on the seabed. The Scottish Government (2024) report however concludes that in Scotland, guillemot may experience the pressure of underwater noise "*to a small extent*", and "*Limited evidence suggests a potential negative effect from underwater noise but the impact is expected to be temporary*".

180. Based on the information provided, auk species (guillemot, razorbill and puffin), as longer duration diving birds within the WDA, are considered to be the IOFs for this impact, and are of **medium** sensitivity.

11.11.1.4.3.3 Impact

181. All piling during construction would incorporate soft-start and ramp-up procedures (see **Appendix 9 Draft MMMP**), which would allow seabirds to move away from the source of impact prior to it reaching levels that may cause injury or death.

182. As outlined in the Realistic WCS (**Table 11.5**) there would be no simultaneous piling activities, and so any disturbance-related displacement of auks is likely to be localised, short-term and reversible, with evidence presented in Impact 2 (indirect impacts) suggesting that prey species are likely to quickly return after cessation of piling activities.

183. UXO clearance activities also have the potential to cause short-duration, high-level impulsive noise. NatureScot Guidance Note #6 acknowledges that "*there is limited evidence available to indicate that significant disturbance from underwater noise is likely (i.e. from noisy pre-construction activities such as high order UXO detonation and geophysical surveys) … Mitigation measures necessary to reduce impacts to marine mammals species will help reduce any impacts to diving seabird species in the absence of such evidence*."

184. The Project will adopt low-order clearance methods wherever practicable, substantially reducing source levels and impact ranges (see **Appendix 9 Draft MMMP**). This is also likely to restrict impacts on auks, with birds having greater potential to avoid injury, as well as reducing the area that may be temporarily unavailable due to disturbance.

185. Impacts of construction related subsea noise on auk species are therefore considered to be of **negligible** magnitude at a population level. It also follows that, for other IOFs of lower sensitivity, **negligible** impacts would also occur.

11.11.1.4.4 Disturbance Associated with Vessel Movements to and from Ports

11.11.1.4.4.1 Screening of IOFs for assessment

186. In their Scoping Opinion (see **Table 11.2**), NatureScot advises that disturbance and displacement from vessel movements should be assessed during all phases of the Project as vessels transiting

between ports and the WDA may potentially cause disturbance to birds using their preferred foraging areas. Seaducks and diver species were highlighted as having greater potential to be impacted.

187. NatureScot Guidance Note #4: *Overview of connectivity to marine SPAs* advises that for all inshore wintering waterfowl and non-breeding seabird qualifying features of marine SPAs, impact pathways need to be considered within 15 km of a marine SPA. This includes vessel traffic routes.

188. In relation to EIA impacts on offshore ornithological qualifying features due to vessel movements associated with the Project, three possible impact pathways have been identified:

- Offshore non-breeding seabirds and inshore wintering waterfowl being disturbed by vessel movements;
- Breeding seabirds using waters adjacent to the colony engaging in maintenance activities such as preening, bathing and displaying, being disturbed by vessel movements; and
- Breeding red-throated divers being disturbed by vessel movements whilst foraging in inshore waters.

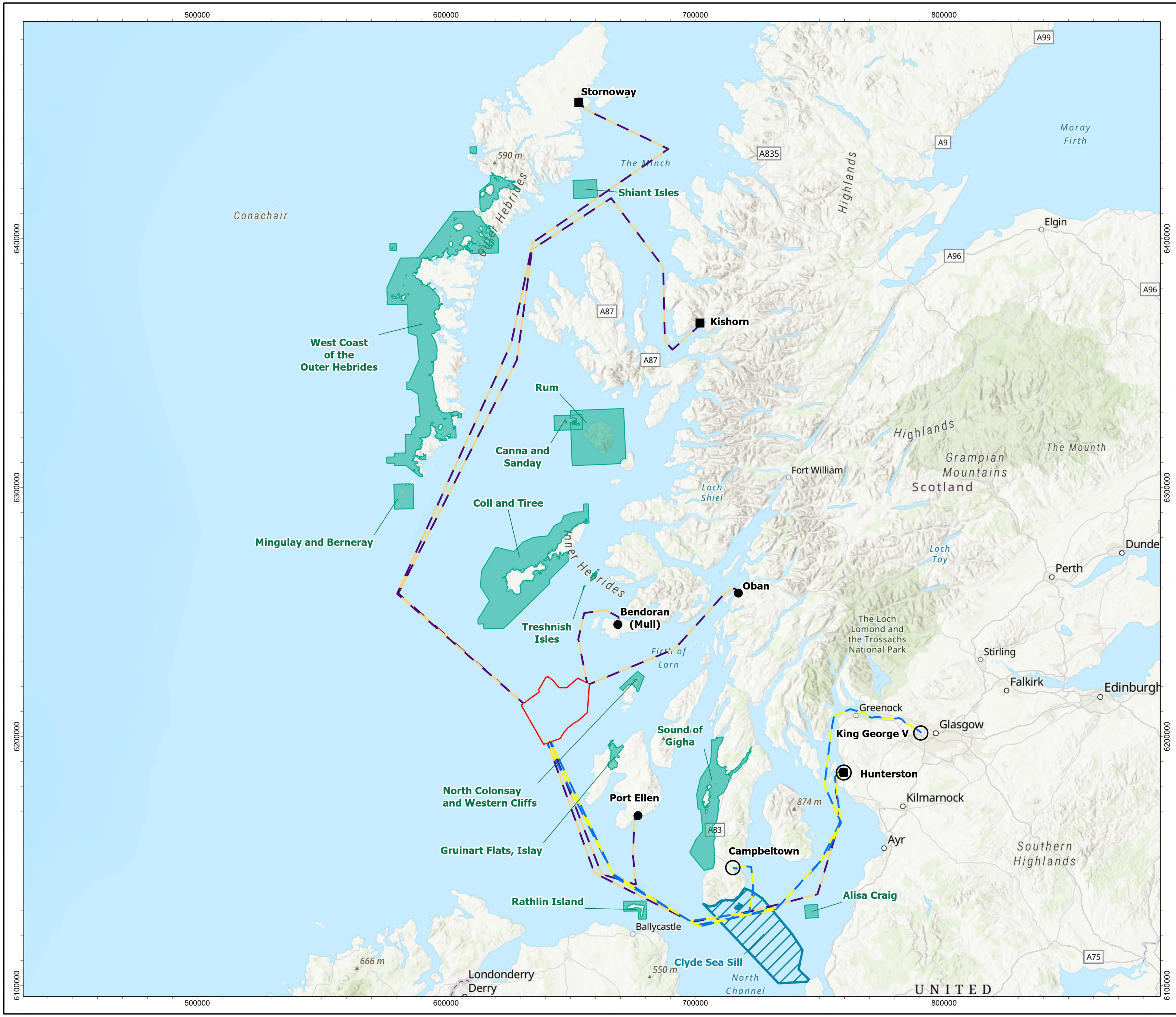
189. Which impact pathways, and which species may be affected by vessel movements to and from the WDA depends on the location of the port(s) used and routes taken, which at present, are unconfirmed from a list of indicative port options.

190. In general, important areas for aggregations of non-breeding waterbirds around the western Scottish coastline have been identified through a series of aerial surveys carried out by JNCC[5] and have been used to inform the selection of marine SPA areas. Thus, it is likely that most key aggregations of offshore ornithological features that are not breeding seabirds reside within marine SPA boundaries. The WDA does not overlap with any marine SPAs, nor is it within 15 km of any marine SPAs, but vessel transit corridors from port to the WDA may pass through or near marine SPAs. All indicative vessel transit corridors between ports and the WDA that could potentially be used by the Project were therefore plotted using GIS. The following potential port locations considered are:

- Marshalling and Assembly (Construction): Kishorn, Arnish/Stornoway and Hunterston.
- Marine Operations (Construction): Oban, Port Ellen and Bendoran (Mull).
- Operation & Maintenance: Campbeltown/ Machrihanish. King George V (Glasgow) and Hunterston.

191. Locations of these ports and indicative transit corridors are shown in **Figure 11.2**. Location of SPAs and a Nature Conservation Marine Protected Area (NCMPA) with breeding seabird features, breeding red-throated diver features and wintering waterbird features are also shown on **Figure 11.2** as areas supporting important aggregations of these species.

[5] https://jncc.gov.uk/resources/10fb6f1b-6d8d-449c-a572-f9411dd65d46



N

- Windfarm Development Area (WDA)

Ports

- Marine Operations
- Marshalling & Assembly
- O&M

Indicative Vessel Transit Corridors

- Construction
- O&M
- Special Protection Areas
- Clyde Sea Sill Marine Protected Area

0 25 50 75 Kilometres

REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
1	23/04/2026	MMM	MMM	NG/SO	NG/SO

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000207		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:1,450,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		
DRAWING TITLE	MachairWind Potential Ports/Harbours and Indicative Vessel Transit Routes		

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ScottishPower Renewables

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192. Two marine SPAs with wintering waterfowl qualifying features are located within 15 km of the WDA, identified ports or indicative vessel routes – Coll and Tiree SPA for great northern diver and common eider, and the West Coast of the Outer Hebrides SPA for great northern diver, black-throated diver, common eider, long-tailed duck, red-breasted merganser and Slavonian grebe. The origin ports that may require vessels to pass through or near these SPAs are Arnish/Stornoway and Kishorn. Indicative vessel routes pass near the marine component of several SPAs classified for their breeding seabird features (see **Figure 11.2**). However, as these vessels will not pass through the marine component of these SPAs, and as breeding seabirds are less sensitive to disturbance than waterbirds, especially divers (Bradbury et al., 2014), these breeding seabird features will not be disturbed and/or displaced by vessels using the indicative transit corridors. Whilst indicative vessel transit corridors are beyond the foraging range of breeding red-throated divers (10 km as per Guidance Note #4), there is a functionally linked SPA. Mointeach Scadabhaigh SPA is a terrestrial SPA supporting breeding red-throated divers. These birds use the West Coast of the Outer Hebrides SPA for feeding, during the breeding season. However, as indicative transit corridors pass to the east of the Outer Hebrides, vessels would cause no disturbance to foraging red-throated divers from the Mointeach Scadabhaigh SPA. Consequently, all seabirds and breeding red-throated diver have been scoped out. The Clyde Sea Sill NCMPA however includes breeding black guillemot as a feature, and would be transited by vessels, if originating from Glasgow or Hunterston.

193. Söhle et al. (2009) focussed their inshore waterbird surveys around the islands of Mull, Coll and Tiree on greater scaup, common eider, long-tailed duck, red-breasted merganser, red-throated diver, great northern diver and Slavonian grebe. Aerial surveys of aggregations of seaducks, divers and grebes in 2007-08 (Lewis et al., 2008) included waters around Coll, Tiree, Wester Ross Inner Sound and Sea Lochs and reported on the aforementioned species as well as common scoter, velvet scoter, common goldeneye and black-throated diver.

194. These seaduck, grebe and diver species therefore form the IOFs considered for assessment.

11.11.1.4.4.2 Sensitivity

195. For non-seabird species and species groups that have a distribution that might overlap with Project vessel transit routes, the susceptibility of the species to disturbance was considered based on reviews by Schwemmer et al. (2011) and Goodship and Furness (2022).

196. Schwemmer et al. (2011) investigated flush distances from vessels by several species of diver and seaduck, within and outwith shipping lanes. Flush distances for the seaduck and diver species that were included in this study were described as: very high for common scoter, moderate to high for long-tailed duck, low to moderate for common eider, moderate to high for velvet scoter and very high for great northern, red-throated and black-throated divers. Flush distances were highly variable among individuals of the same species. Schwemmer et al. (2011) also found that, unlike seaduck, divers did not habituate to vessels, showing no reduction in flushing distance in shipping lanes, compared to other areas.

197. Goodship and Furness (2022) undertook a review of flush distances of a range of species, including divers, grebes and seaduck, both during the breeding season and the non-breeding season.

198. Divers are considered to have a high sensitivity to boat disturbance and human activity in marine areas during the non-breeding season. Red-throated and black-throated divers are considered to be particularly sensitive to marine activity, and both species are known to avoid shipping lanes (Schwemmer et al., 2011). A protective buffer zone of at least 1 km has been suggested to protect red-throated and black-throated divers during the non-breeding season (Goodship and Furness, 2022).

199. Great northern divers are considered to have a medium/high response to human disturbance and a buffer zone up to 350 m has been suggested to protect this species during the non-breeding season (Goodship and Furness, 2022). This diver species has been identified as having a high vulnerability to disturbance by boats (Furness et al., 2013, Jarrett et al., 2018), and may swim away from the path of ferries up to 4 km away (Jarrett et al., 2018), although as great northern divers spend a high proportion of daylight hours foraging during the non-breeding season it may be difficult to distinguish between behaviours of diving to avoid nearby boats and diving to hunt for food.

200. Slavonian grebes are known to have a high sensitivity to boat disturbance (Jarrett et al., 2018), a buffer zone up to 350 m has been suggested to protect this species during the non-breeding season (Goodship and Furness, 2022). However, flushing distances of individual birds depends on the extent of habituation and tolerance of disturbance in different areas (Ruddock and Whitfield, 2007). In Argyll, Orkney and Shetland, Slavonian grebes are known to overwinter in areas with frequent ferry and fishing vessel traffic, salmon and mussel farming activity (Argyll Bird Reports volumes 12 to 29; Upton et al., 2018; Jackson, 2018), and these populations appear to be tolerant of these practices.

201. Seaducks are considered to be sensitive to boat disturbance and human activity in marine areas during the non-breeding season (Goodship and Furness, 2022). Scoters are considered to be the most sensitive seaduck species in the UK, and common scoter may flush from boats that are over 3 km away (Schwemmer et al., 2011). Goldeneye is also vulnerable to boat disturbance and a buffer up to 800 m has been suggested to protect this species during the non-breeding season (Goodship and Furness, 2022). Buffers of up to 450 m to 500 m have been suggested to protect greater scaup and common eider during the non-breeding season, both of these seaduck species are considered to be of high vulnerability to disturbance by boats (Furness et al., 2013; Mendel et al., 2008; Jarrett et al., 2018), although flush distances vary between individuals, in different weather conditions and stage of moult. Long-tailed duck and red-breasted merganser were not reviewed by Goodship and Furness (2022), but these seaduck species were considered to have a moderate disturbance susceptibility score similar to that of common eider and Slavonian grebe in a review by Bradbury et al. (2014). Likewise, black guillemot was not included, but has been given a moderate disturbance score, similar to other auk species.

202. It is important to note that all bird species are likely, to some degree, to habituate to disturbance, and birds present in highly disturbed areas (e.g. those within or close to shipping lanes) are more likely to show some habituation to disturbance and tolerate a shorter disturbance than birds of the same species in less disturbed areas. As well as differing levels of habituation between individuals, a wide range of other factors (e.g. weather, flock size, bird age etc.) can influence behavioural responses to disturbance and therefore response to vessel traffic is very likely to vary between individuals (reviewed in Goodship and Furness, 2022).

11.11.1.4.4.3 Impact

203. **Appendix 6 Outline EMP** is considered as embedded mitigation for the assessment and describes current best practice for all construction and O&M vessel activities to be adopted in vessel transit corridors (**Table 11.13**). This will include guidance on vessel speed and highlight the requirement to be aware of aggregations of birds on the water and to moderate speed and course accordingly. In addition, **Appendix 6 Outline EMP** includes that indicative vessel transit corridors are routed to avoid passing through all marine SPAs including marine components of terrestrial breeding seabird SPAs. Indicative transit corridors are also routed to be as distant as possible from marine SPAs with wintering waterbird features, which are particularly sensitive to vessel disturbance. This will be further developed post-consent, once there is certainty over which ports/harbours will be used during construction. Vessels will be required to adhere to the EMP, including the requirement to follow indicative transit corridors where possible.

204. The vessel routes from Arnish/Stornoway and Kishorn pass through relatively inshore marine waters, and consequently, it is possible that concentrations of wintering waterfowl may be impacted.

205. The indicative vessel transit corridors pass within 15 km of the Coll and Tiree SPA, which is designated for great northern diver and common eider. At its closest point, the indicative transit corridor between the WDA and the ports of Stornoway and Kishorn passes approximately 12 km from the southwest boundary of the Coll and Tiree SPA. This means that only a small portion of the most south-westerly part of the SPA would be within 15 km of transiting vessels. The distributions of eiders and great northern divers presented in Söhle et al. (2009) show that eiders do not regularly use the south-westerly part of the marine SPA. Eiders tend to have a more coastal distribution, favouring shallow waters (Woodward & Humphreys, 2018), compared with great northern diver. The great northern diver distribution in the Coll and Tiree SPA could potentially be disturbed/displaced by vessels in transit due to this species having a distribution occurring further offshore and this species regularly occurring within the south-westerly part of the marine SPA (Söhle et al., 2009). Whilst great northern divers are known to be sensitive to the presence of vessels (Jarrett et al., 2018; Schwemmer et al., 2011), vessels associated with construction of the Project will not pass sufficiently close to the SPA (>12 km) to cause any disturbance to this feature.

206. Lewis et al. (2008) surveyed the waters around Wester Ross Inner Sound and Sea Lochs which the indicative vessel transit corridor from Kishorn would also bisect. Within the Wester Ross Inner Sound and Sea Lochs area, numbers of wintering waterbirds were generally very low, with 30 common eiders and 11 great northern divers present.

207. The citation[6] for the West Coast of the Outer Hebrides SPA describes the marine site regularly hosting populations of European importance of great northern diver, black-throated diver and Slavonian grebe over winter, and migratory common eider, long-tailed duck and red-breasted merganser. NatureScot's West Coast of Outer Hebrides SPA Conservation and Management Advice document[7] describes the distributions of these species, with great northern divers, common eiders and long-tailed ducks found widely across the SPA, and black-throated divers, Slavonian grebes and red-breasted mergansers having more restricted distributions, mainly being found in more sheltered inshore areas. Most of the SPA is screened from vessels using the indicative transit corridor between the WDA and the ports of Stornoway and/or Kishorn by the islands of the Outer Hebrides. There is theoretically potential for disturbance of waterbirds birds in the SPA, by vessels using the indicative transit corridors, at three points where the SPA boundary reaches the Minch (on the east coast of the Outer Hebrides), However, indicative transit corridors are still far from the SPA boundary. At its closest point, the indicative transit corridor passes approximately 7 km from the SPA. Elsewhere, the SPA boundary is 10-13 km from the indicative transit corridor, where not screened by land.

208. Within the Clyde Sea Sill NCMPA waters, the SMP database included a whole colony count of 207 individual black guillemots on the Sanda Islands in 2019. However, because the foraging range of the species is relatively small (given as a mean maximum of 9.1 km in Woodward et al. (2019), there is unlikely to be much overlap in vessel routes with foraging waters.

209. Based on known species distributions summarised above, great northern diver is therefore the species most likely to be impacted at a wintering population level by vessel movements to the WDA, due to the combination of relatively high estimated abundance and **high** sensitivity rating. Common eider has been attributed a lower sensitivity rating and has a relatively inshore distribution, sufficiently far from indicative transit corridors to avoid any disturbance to this species. Other species are present

[6] https://www.nature.scot/sites/default/files/special-protection-area/10484/spa-citation.pdf
[7] https://www.nature.scot/sites/default/files/special-protection-area/10484/conservation-and-management-advice.pdf

at much lower densities, and/or have more inshore distributions, and it is unlikely that the transient movements of vessels would impact at a population level.

210. The Goodship and Furness (2022) review states that during the non-breeding season, great northern divers at sea are quite likely to swim or dive within the extent of 200-300 m from a passing ferry and may also swim (but very rarely fly) out of the path of ferries up to 4 km away (Jarrett et al., 2018), and if exposed to an energetic bottleneck in winter, any increase in energy costs caused by disturbance may influence body condition and therefore potentially influence overwinter survival.

211. In relation to the nature of the impact of construction vessel movements on great northern divers, despite the species' **high** sensitivity to disturbance, vessels near aggregations of these birds, e.g. around the west coast of Tiree and certain points along the east coast of the Outer Hebrides, would only be present in an area for a short period of time, after which any disturbed birds would be able to return to their behaviours they were undertaking prior to the disturbance. However, the risk of disturbance is very low due to the distance between the aggregations of great northern divers and vessels (7 km at the closest point but mostly >10 km). As well as spatial separation between the source of impact and aggregations of great northern divers, there is also a degree of temporal separation. Most construction will take place during good weather conditions and construction activities will be substantially reduced during winter months. Consequently, the number of vessel transits near aggregations of great northern divers will also be reduced during winter months.

212. Therefore, when accounting for embedded mitigation measures as part **Appendix 6 Outline EMP**, the impact on all seabird and waterbird species due to increased vessel numbers along established shipping routes is considered to be of **negligible** magnitude.

11.11.1.4.5 Overall Significance of Impact 1: Direct Distributional Responses and Displacement Effects

213. The construction works associated with the WDA are temporary and localised in nature and the magnitude of impact has been determined as negligible in each case, for all IOFs. Great northern diver and some seaduck species are considered to be of high sensitivity to disturbance and therefore the overall effect significance for these species is **minor adverse**, while all other species are of medium sensitivity to disturbance and hence the effect significance is **negligible.** Therefore, overall this is **not significant** in EIA terms.

11.11.1.5 Impact 2. Indirect Disturbance and Displacement of Prey Species

11.11.1.5.1 Summary of Potential Impacts

214. Indirect disturbance and displacement of birds may occur during the construction stage if there are direct impacts on prey species, or on the habitats of prey species. Indirect effects include those resulting from increased suspended sediment concentrations and redistribution; temporary habitat loss and disturbance (e.g. during preparation of the seabed for foundations and cable installation); or the production of underwater noise (e.g. during piling or UXO clearance) that may alter the behaviour or availability of bird prey species. Permanent habitat loss is considered under Impact 6: Indirect habitat loss, during the O&M phase.

215. The potential effects on benthic fauna, fish and shellfish have been assessed in **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish** and the conclusions of those assessments inform this assessment of indirect effects on IOFs.

11.11.1.5.2 Sensitivity

216. The Joint SNCB (2017; updated 2022) guidance provides a list of susceptibility to disturbance and habitat specialisation scores for bird species found in Scottish waters (based on Furness et al., 2013, and the expanded list for wider UK waters in Bradbury et al. (2014). Habitat specialisation is often

tied to a specialisation of prey species, and so those seabird species with greater specialisation, combined with other limiting factors such as foraging range, are considered to be more susceptible to indirect habitat loss/ change impacts during construction.

217. The species groups with highest specialisation scores in the guidance include divers, seaducks and grebes, with seabirds having low or moderate scores. For the IOFs, great norther diver, auks and tern species are considered to have **medium** sensitivity to indirect construction effects due to habitat specialisation, whereas gulls, petrels, gannet and shearwaters are considered to have **low** sensitivity.

11.11.1.5.3 Impact

218. With regard to changes to the seabed and to increased SSC and redistribution, **Chapter 8 Benthic Ecology** assesses the nature of any change and impacts on the seabed and benthic habitats, based on the worst-case scenario.

219. It was concluded that given the short-term and temporary nature of the increases in suspended sediments and associated light smothering and siltation, the magnitude of impact on benthic ecology for both pressures is considered to be low; and given the short-term, localised and temporary nature of heavier smothering and siltation effects associated with cable installation (ploughing), the magnitude of impact is considered to be **negligible**.

220. Regarding temporary physical disturbance / habitat loss, installation of the WTG/OSP foundations, offshore cable installation and sandwave levelling was predicted to result in a **negligible** magnitude impact, due to the temporary, episodic and relatively localised nature of the impact and resilience of the majority of benthic ecology receptors which are common across the wider region.

221. All construction effects on benthic ecology were therefore considered to be not significant (**minor adverse**).

222. With regard to potential impacts on fish and shellfish prey species, **Chapter 9 Fish (Including Basking Shark) and Shellfish** also assesses increased SSCs and redistribution and temporary physical disturbance / habitat loss, as well as underwater noise and vibration.

223. In relation to temporary physical disturbance / habitat loss, it has been identified that the topic Study Area overlaps with potential spawning grounds for several species, including sandeel, herring and shellfish. It also intersects with areas of higher spawning intensity for less sensitive benthopelagic species (Norway pout), as well as regions of uncertain intensity for other less sensitive pelagic species (sprat) and demersal species (plaice).

224. The majority of sediment within the WDA is categorised as ‘Sand’ and ‘gravelly Sand’ which can be considered as preferred sandeel habitat. Sandeels require very specific sediment types for spawning, making them vulnerable to localised physical disturbance and temporary habitat loss. Recovery of sandeel populations is however generally expected to occur relatively quickly once sediments return to their natural state following infrastructure installation. This recovery happens through the return of adult fish and larval settlement in suitable sandy substrates.

225. Herring also require very specific sediment types for spawning, with suitable habitats limited to gravel, sandy gravel, and gravelly sand.

226. Evidence presented in the chapter indicates that both sandeel and herring populations typically rebound rapidly after construction-related disturbance. This resilience is largely due to recolonisation from adjacent undisturbed areas and larval recruitment. Although sandeel are particularly sensitive to subsurface disturbance during their overwintering period, sediment recovery in sandy and muddy environments generally occurs within one to two years.

227. Although there is an overlap in shellfish spawning ground and the topic Study Area, evidence suggests that areas of suitable habitat do not overlap with the WDA itself and have a relatively small presence within the topic Study Area when compared to the overall areas of suitable habitat and distribution of burrows. For this reason, any physical disturbance within the WDA is unlikely to have a meaningful impact on shellfish spawning areas.

228. For other pelagic species with spawning grounds that overlap with the Study Area such as Norway pout and sprat, their spawning is not strongly dependent on substrate type as spawning often occurs in open water, reducing the likelihood of significant effects.

229. Fish and shellfish species most vulnerable to temporary disturbance/habitat loss are also those whose nursery areas coincide with the boundaries of the fish and shellfish ecology Study Area. These include herring, plaice and whiting. There is also overlap with low or unknown intensity nursery grounds for sandeel, Norway pout, mackerel, plaice, cod, and saithe, among other species.

230. Species that rely on the area for early life stages, such as shelter, feeding, and growth, make these nursery grounds ecologically significant. However, because juvenile stocks of fish are less sensitive to physical disturbance than spawning adults, as they have high levels of adaptability and tolerance to transient stress and disturbance, they are expected to temporarily relocate during construction activities and return once disturbance ends.

231. Shellfish species are generally less mobile than many fish species, but they tend to recover quickly after localised seabed disturbance. Evidence from studies at offshore windfarms presented in the chapter suggests that temporary construction-related closures can even provide short-term benefits to crustacean populations by reducing fishing pressure during the disturbance period.

232. Pelagic fish (e.g., mackerel, herring) spend most of their time in the water column, and this behaviour means they are largely unaffected by seabed disturbance or temporary habitat loss during construction activities.

233. Overall, the effect significance from seabed disturbance and habitat loss for all fish and shellfish receptors was considered to be **negligible** or **minor adverse**, and not significant.

234. Regarding increased SSCs, sediment re-deposition can alter the seabed's particle size distribution, which may lead to the loss of spawning habitats for species that require specific substrates, such as herring and sandeel. Additionally, increased concentrations of suspended sediment could discourage adult fish from entering their usual spawning grounds. For herring, potential increases in SSC and sediment deposition within suitable spawning habitats were concluded unlikely to pose a major risk, as research indicates herring eggs can tolerate relatively high sedimentation levels; and for sandeel, modelling undertaken for the Project indicates that predicted deposition is highly localised and composed of the same sand-dominated material already present within the WDA; combined with the naturally dynamic bedload transport regime, this means no change to sediment grain-size distribution within preferred sandeel habitat is expected. Similarly, pelagic fish, demersal fish, and elasmobranchs are considered to have low sensitivity overall. These groups are highly mobile and can avoid areas with elevated SSCs, reducing the likelihood of sediment-related impacts.

235. Shellfish, including molluscs and crustaceans, generally have limited mobility and cannot easily escape areas affected by elevated SSCs or sediment redeposition. Despite this, many species demonstrate tolerance to increased turbidity and resilience to partial smothering, and because any rise in sediment levels will be short-term and highly localised, impacts are expected to be minimal.

236. Overall, the significance of effects due to SSCs and sediment redeposition was considered to be negligible for all receptors, apart from herring and sandeel spawning grounds which were concluded as **minor adverse** (not significant).

237. Regarding underwater noise and vibration, detailed underwater noise modelling presented in **Appendix 10.1 Underwater Noise Modelling Report** used a worst-case scenario, which was identified as the installation of six sequential jacket pin piles at the 'West' modelling location, where deeper water and site conditions result in the greatest predicted sound transmission.

238. Model results indicate that, under the worst-case piling scenario, peak pressure thresholds for potential injury occur within a few hundred metres of the pile. If fish are assumed to remain stationary, cumulative sound exposure levels could extend over several kilometres. When realistic fleeing behaviour is considered however, predicted injury zones reduce to tens or hundreds of metres, and Temporary Threshold Shifts (TTS) zones shrink to a few kilometres for the most sensitive Group 4 species such as herring and sprat.

239. All piling will incorporate soft-start and ramp-up procedures (see **Appendix 9 Draft MMMP**), allowing fish to move away before peak energy strikes occur. The likelihood of injury is therefore low, and any effects are expected to be short-term and reversible.

240. Potential herring spawning grounds within the **Chapter 9 Fish (Including Basking Shark) and Shellfish** Regional Study Area are shown in Figure 9.4, which illustrates that the majority of important herring spawning habitat, including the highest probability spawning areas, is located outside the predicted ranges for TTS, recoverable injury, and mortality.

241. For sandeel spawning grounds, the majority of the higher-suitability areas lie outside the predicted ranges for mortality, potential mortal injury, recoverable injury, and TTS. A relatively small (in comparison to the extent of sandeel habitat) area intersects with patches of more probable sandeel habitat. This limited overlap suggests that a small proportion of the local sandeel population may experience short-term, reversible, non-injurious TTS in hearing disturbance during piling, but that such effects would be spatially restricted and reversible.

242. Given the limited extent of habitat overlap, the temporary nature of TTS, and the wider availability of suitable sandeel habitat across the region, the predicted impacts during the spawning and burrowing season are not expected to lead to population-level effects. The combination of spatial separation, limited exposure, and the resilience associated with reversible auditory changes supports the conclusion that sandeel populations will not be adversely affected at a meaningful scale.

243. UXO clearance activities also have the potential to cause short-duration, high-level impulsive noise. Modelling of UXO detonations, reported in **Appendix 10.1 Underwater Noise Modelling Report**, predicted potential mortal-injury ranges to be less than 1 km for the largest charge, with recoverable-injury and behavioural responses extending a few kilometres at most. The Project will adopt low-order clearance methods, substantially reducing source levels and impact ranges (see **Appendix 9 Draft MMMP**).

244. Continuous, lower-level noise will also arise from vessel movements, drilling, trenching, rock placement, and offshore cable installation. Modelled source levels are however substantially below continuous-noise thresholds for TTS and recoverable injury as defined by Popper et al. (2014). Predicted received levels at realistic exposure durations are therefore well below injury or TTS criteria, and effects are limited to minor, transient behavioural reactions within tens of metres of active equipment.

245. Overall, the effects of underwater noise and vibration on fish and shellfish were considered to be of **negligible** or **minor adverse** significance, which is **not significant** in EIA terms.

11.11.1.5.4 Overall Significance of Impact 2: Indirect Disturbance and Displacement of Prey Species

246. Overall, the conclusions of the assessments on prey species in **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish** suggest that construction impacts are in

general likely to be localised, short-term and reversible, and no significant effects were predicted, particularly when suitable mitigation measures such as soft-start piling and low-order UXO clearance methods are taken into account.

247. It can therefore be reasonably concluded that, based on the information summarised above, the consequent magnitude of impact on all seabird IOFs during construction is **negligible**, and the effects to species of medium or high sensitivity are considered to be **negligible** or **minor adverse** respectively, and **not significant** in EIA terms.

11.11.1.6 Impact 3. Artificial Lighting on Project Infrastructure and Vessels

11.11.1.6.1 Summary of Potential Impacts

248. In addition to visual and noise impacts associated with construction activities, artificial lighting at night (ALAN) may potentially be a source of attraction, disorientation or displacement for birds. A semi-quantitative assessment of the risks of ALAN on seabirds is presented in the **RIAA** and, for brevity, is summarised here within an EIA context. The main sources for this are a review by Deakin et al. (2022), which has recently been updated by Furness et al. (2026).

249. The mechanisms by which ALAN during construction could impact upon seabirds are:

- Mortality through collision with vessels as a result of being attracted to ALAN;
- Mortality or reduced breeding success through increased energetic costs or time not spent foraging, due to disorientation caused by ALAN on any structures or vessels; or
- Mortality or reduced breeding success caused by avoidance of vessels or structures, through a changed energetic balance caused by increased time flying or due to being displaced from an area where individuals may otherwise have foraged or rested on the sea surface (i.e. temporary displacement effects).

250. Construction is planned to take place 24 hours a day over a period of up to five years, and so artificial lighting would be required around areas of work and on structures within the WDA, and on vessels within and outside of the WDA.

251. As outlined in **Table 11.5**, as a worst-case, a maximum of 117 vessels could be in the WDA at any one time during construction but generally, numbers of vessels will be much lower. Vessels will be needed for foundation installation, WTG installation, OSP installation and cable installation. Associated with these are support and supply vessels, accommodation and crew transfer vessels. Although most of these vessels would not routinely be particularly brightly lit, any operations occurring in darkness will require good lighting and so at times, some vessels will be illuminated.

252. During construction, preferred anchoring areas are expected to be at the entrance to Loch Gruinart and in west Islay (see **Appendix 13 Outline Vessel Management and Navigational Safety Plan** for more details). When at anchor, vessels may also have the potential to attract shearwaters and petrels but are likely to have fewer bright lights than when undertaking operations.

11.11.1.6.2 Screening of IOFs for Assessment

253. In Deakin et al. (2022), key species considered to be at potential risks from artificial lighting included European storm-petrel and Manx shearwater, both of which are likely to be present in non-trivial numbers within the WDA, are active at night, and are thus considered as IOFs. European storm-petrel were recorded in low numbers in the WDA by DAS but this is likely to be an underestimate of the true numbers of European storm-petrels using the WDA, due to them being small and dark coloured and therefore at risk of under-detection by DAS (Rhoades et al., 2025).

254. No Leach's storm-petrels (also nocturnally active) were recorded on any survey of the WDA. Whilst Leach's storm-petrels are likely to be significantly under-recorded by digital aerial surveys, it is also

likely that individuals were not using the WDA as the species tends to forage to the west of Scotland, along the continental shelf edge and so are unlikely to be using inshore waters, such as the WDA (Bolton et al., 2025).

11.11.1.6.3 Sensitivity

255. Although rated as of very low sensitivity to disturbance associated with construction vessels, noise and visual stimuli, Manx shearwater and European storm-petrel are considered to be of **high** sensitivity to artificial lighting impacts, on the basis of consultee advice. In an assessment of the marine-based conservation issues facing the storm-petrels (Hydrobatidae and Oceanitidae), Dias et al. (2019) highlighted attraction to artificial light sources as one of the main threats.

11.11.1.6.4 Impact

256. A qualitative assessment of the risk of potential impacts associated with ALAN is presented in the **RIAA**, considering the relative importance of the WDA to Manx shearwaters and European storm-petrels, in terms of the wider regional population size and spatial distribution of these two species, informed by boat and aerial survey data, as well as tracking data. Evidence that shearwaters and petrels are attracted to ALAN is reviewed, and the risk of Manx shearwaters and European storm-petrels being attracted to ALAN associated with the Project is considered. This process is summarised below for an EIA context.

11.11.1.6.4.1 Relative Importance of the WDA

257. Relatively large Manx shearwater counts were recorded during surveys, mainly in the breeding season and spring migration period. A peak count of 2,865 Manx shearwaters, including apportioned birds, was recorded in the WDA plus 4 km buffer in April 2022, but very few Manx shearwaters were recorded within the WDA plus 4 km buffer between October and January.

258. All storm-petrels were recorded during the calendar months of June to August in the breeding season, and a peak count of 35 apportioned European storm-petrels was recorded in the WDA plus 4 km buffer in July 2023.

259. Manx shearwater and European storm-petrel density and abundance may be underestimated, when generated by data collected by digital aerial survey, due to a combination of factors including nocturnal activity, size, detectability and identification challenges (Rhoades et al., 2025). Furness et al. (2026) concluded that, "*It is probably necessary at present to assume that DAS fails to detect many or most storm-petrels present in survey transects*." Therefore, true abundance of European storm-petrels in particular using the WDA is likely to be higher than the estimates presented above.

260. The numerical importance of the WDA was evaluated in the **RIAA** by comparing the abundance of Manx shearwaters estimated to be in the WDA with the wider regional population size. If the WDA is a particularly important area for Manx shearwaters, abundance would be expected to be relatively high.

261. Assuming that one adult in each breeding pair is either incubating or brooding, then based on regional population size, this would mean there are very approximately 900,000 adult breeding Manx shearwaters at sea within foraging range of the WDA, at any point in the breeding season until the post-brooding stage. In the post-brooding stage, both adults could be assumed to be at sea and potentially using the WDA. The proportion of the regional breeding adult Manx shearwater population using the WDA was estimated as being between 0.16% and 1.34% of the regional population, depending on the abundance estimate used and assumptions around the regional population size. These low percentages suggest the WDA is not an area of particularly high importance for Manx shearwaters but that the WDA is regularly used by this species.

262. It was not feasible to use a semi-quantitative approach for European storm-petrels as the abundance estimates are likely to be substantial under-estimates of the true numbers of birds using the WDA. However, the importance of the WDA to European storm-petrels is considered further below.

263. In order to determine the spatial distribution of Manx shearwaters and European storm-petrel, aerial and boat-based survey data, as well as tracking data, are presented in the **RIAA** and reviewed with the aim of evaluating the relative importance of the WDA to these species. In summary, the tracking data and aerial/boat-based survey data all tended to show that Manx shearwaters from many colonies either enter the WDA or fly close to it (e.g. Critchley et al., 2019; Owen and Morgan, 2026; The Crown Estate, 2026). However, the WDA does not appear to be an area of high importance to Manx shearwaters and other nearby areas are used more frequently. In April 2022, a particularly high abundance of Manx shearwaters was in the WDA. 85% of these birds were sat on the sea, with only 15% in flight. It is not clear why such an exceptionally large aggregation should occur in the WDA.

264. There is evidence that immature European storm-petrels return to UK waters in the breeding season but, as non-breeders, they are not tied to colonies. It is thought that the large numbers of European storm-petrels recorded in the North Atlantic, along the continental shelf edge (Waggit et al., 2020) are likely to be immature birds. Deakin et al. (2026), Bolton et al. (2021) and Bolton et al. (2025) show that breeding adult European storm-petrels do not forage at such substantial distances from their colonies and instead use inshore areas. Therefore, breeding adult European storm-petrels and their fledglings are more likely to encounter offshore windfarms, including the Project, than the immature component of the population.

265. Breeding European storm-petrels from the colony at Lunga, Treshnish Isles, also entered the WDA but key areas for individuals from this colony were around the Treshnish Isles and to the west and north of the colony (Bolton et al., 2025).

266. Overall, the spatial and numerical assessment of the relative importance of the WDA to Manx shearwaters and European storm-petrels shows that both species do regularly use the WDA but that it does not appear to be a particularly important area for either species. There is no evidence to suggest the WDA is a foraging hotspot for either species, nor a key area used for resting on the water or rafting by large numbers of birds.

11.11.1.6.4.2 Risk of Attraction to Artificial Lighting Associated with Construction

267. The conclusions for petrel and shearwater species being attracted to, or disorientated by ALAN, as determined in the Furness et al. (2026) review is briefly summarised here.

268. The review found that stranding or grounding events and collisions (including ‘deck strikes’ on vessels) with structures as a result of attraction to ALAN are very rare events for adult shearwaters and petrels and that adults can avoid brightly-lit structures. However, grounding and collisions of fledgling shearwaters and storm-petrels due to attraction to ALAN can occur frequently (Furness et al., 2026). Grounding and/or collisions are rare on bright moonlit nights and tend to occur when visibility is poor, e.g. on foggy nights (Furness et al., 2026).

269. Furness et al. (2026) suggested that fledgling shearwaters and storm-petrels are attracted to ALAN as part of the fledging process due to them moving towards the lightest area they can see. This would normally be the sea under natural conditions, in the absence of any ALAN. This attraction to light seems to be lost soon after fledging and is not seen in adults. Adults appear to avoid ALAN when natural light at night is good and visibility is good, but it is likely that under conditions with no moonlight and low visibility, ALAN will disorient birds that come close to bright lights and that confusion/disorientation will lead to birds flying in circles trying to “get their bearings” from landmarks, moonlight or stars. When those features are not visible and birds are subject to bright ALAN, they

may circle closer to the source of light until in many cases they hit obstructions that they cannot see because of the dazzle from the bright artificial light.

270. Furness et al. (2026) observe that a tendency to avoid ALAN in adult shearwaters and petrels, rather than being attracted to ALAN, seems adaptive in that it is likely that predation risk will be higher where there is more light as that permits hunting by birds such as skuas and gulls which tend not to be active in dark conditions, as seen from the tendency of shearwaters and storm-petrels to be less active over their colonies at night when there is bright moonlight and avian predators are more active at colonies. Deakin et al. (2026) also suggested the European storm-petrel at-sea distribution is driven by avoidance of predators. Furness et al. (2026) suggest that the examples of adults being "attracted" to ALAN may represent disorientation and confusion rather than attraction, but with birds finding it difficult to get away from bright ALAN because of the dazzle and disorientation created and lack of visible landmarks.

271. Breeding adults of both species are more likely to be close to colonies at night, thereby reducing the risk of them being in the WDA at night. Manx shearwaters raft on the sea as dusk falls prior to flying to their nests. Rafts occurred in areas up to 4 km from the colony (McSorley et al., 2008). Tagged Manx shearwaters from Skomer and Copeland tended to not fly at night, roosting on the sea surface away from the colony. Individuals that were returning to the colony would roost within 20 km of the colony after returning to the nest (Dean et al., 2013). Therefore, breeding adults returning to the colony would be commuting through or near the WDA in daylight, prior to darkness falling, meaning the risk of commuting birds being attracted to lighting associated with the Project is small.

272. Fledgling shearwaters and petrels can be attracted to brightly lit vessels; however adult shearwaters have been recorded avoiding brightly lit vessels. During construction, there will be some brightly lit vessels, particularly when undertaking operations at night. However, these will move around the site as construction progresses and any risk of attraction will be temporary.

273. The locations proposed for anchoring are to the southwest of the WDA. This means they are further from the closest Manx shearwater and European storm-petrel colonies on Lunga, than when vessels are working in the WDA. Vessels using these anchoring areas will be too far from colonies to risk attracting fledglings from Lunga or Rum.

11.11.1.6.4.3 Impact Magnitude

274. Evidence presented in the review indicates that adult and immature shearwaters and petrels are unlikely to be attracted to ALAN on vessels. However, when European storm-petrel and Manx shearwater chicks are fledging, in August, September and October, there is a small risk that some of these fledglings could be attracted to brightly lit vessels. This risk may be slightly elevated when vessels are closer to colonies, such as Lunga and Rum, to the north of the WDA. The risk would also be higher on nights without a moon and poor visibility. However, tracked fledgling Manx shearwaters from Rum headed southwest from their colonies (The Crown Estate, 2026), suggesting that fledglings from Lunga and Rum would mostly avoid the WDA.

275. Adult shearwaters have been shown to avoid brightly lit vessels. Therefore, there is a small risk of Manx shearwaters deviating from their intended flight path to avoid vessels associated with construction. However, evidence presented above suggests that the WDA is not a key foraging area or roosting/rafting area. Consequently, any avoidance of brightly lit vessels would likely be by commuting birds and a small deviation around individual vessels in their very large foraging ranges would not increase commuting time to any significant extent.

276. The impact of ALAN during construction will be temporary, lasting a maximum of five years, and so would not provide a long-term impact on the regional populations.

277. Overall, the evidence presented in Furness et al. (2026) and summarised above suggests that the WDA is not within an area of high importance for Manx shearwaters and European storm-petrels and that adults and fledglings will not be strongly attracted to, nor will avoid, construction lighting. For these reasons, a **negligible** magnitude impact is predicted for both species.

11.11.1.6.5 Significance

278. The impacts of artificial lighting during construction are temporary and localised in nature and the magnitude of impact has been determined as negligible for Manx shearwater and European storm-petrel. Although the species are of high sensitivity to artificial lighting, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

11.11.1.7 Impact 4. Direct Distributional Responses, Displacement and Barrier Effects

11.11.1.7.1 Summary of Potential Impacts

279. The O&M phase of the Project has the potential to disturb and displace birds in the marine environment due to the presence of permanent structures (WTGs and OSPs), as well as O&M activities. These impact pathways could result in temporary or permanent habitat loss through reduction in the area available for foraging, loafing and moulting birds (i) within and around the WDA; and (ii) on vessel routes to and from port. These are addressed in turn below. Artificial lighting impacts are considered separately under Impact 7.

11.11.1.7.2 Displacement within the WDA

280. The method used to assess operational displacement associated with the Project has been based on NatureScot's Guidance Note #8: *Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds*, with details agreed with NatureScot during consultation.

281. Displacement mortality was quantified using the displacement matrix approach (as per SNCB (2017; updated 2022) only, and not the SeabORD approach, as agreed with NatureScot at the ETG meeting 4 (ETG 4, 2 December 2025). **Technical Appendix 11.4: Displacement** provides information on the rationale of this decision, and the methodology of the matrix approach used, as well as full input values and results, which are summarised here.

282. The matrix approach applies a range of displacement rates (anywhere from 0% to 100% as appropriate for the species) to the population estimate (mean seasonal peak abundance of all birds flying and on sea in the WDA plus 2 km or 4 km buffer). A species-specific and sometimes, season-specific mortality rate range, is then assumed for displaced birds. Both displacement rates and mortality rates for displaced birds used in the estimation of displacement mortality followed NatureScot advice (NatureScot Guidance Note #8).

283. Based on NatureScot Guidance Note #8, the species required to be assessed are those that met the following criteria:

- Species recorded regularly within the WDA plus 2 km or 4 km buffer during baseline surveys (see **Table 11.6** for raw counts within the 4 km buffer); and,
- Species considered susceptible to disturbance (i.e. have medium or high 'Disturbance Sensitivity' and 'Habitat Specialisation' scores as assessed by Bradbury et al. (2014; expanded from Furness et al., 2013), and summarised by SNCB, 2017; updated 2022).

284. NatureScot Guidance Note #8 advises that the priority species for assessment of displacement effects will typically be diver and seaduck species, guillemot, razorbill, puffin and gannet. However, based on the rationale already outlined in **Section 11.11.1.4**, a displacement assessment was

required for nine species regularly found within the WDA plus 2 km buffer (4 km buffer for great northern diver):

- Great Northern Diver;
- Kittiwake;
- Common Tern;
- Arctic Tern;
- Guillemot;
- Razorbill;
- Puffin;
- Fulmar; and
- Gannet.

285. NatureScot Guidance Note #8 was used to provide the appropriate displacement and mortality percentage ranges used in the displacement matrices for kittiwake, guillemot, razorbill, puffin and gannet (**Table 11.20**).

286. Displacement and mortality values to use to estimate fulmar, Arctic tern and common tern displacement mortality were based on disturbance-sensitivity indices as assessed by Bradbury et al. (2014); Arctic tern and fulmar rates were also used in the West of Orkney offshore windfarm application. These rates were agreed with NatureScot at the ETG Meeting 4 (ETG 4, 2 December 2025).

287. Displacement and mortality values used to estimate great northern diver displacement mortality were based on disturbance-sensitivity indices as assessed by Bradbury et al. (2014) and joint SNCB advice (SNCB, 2022b). Joint SNCB advice on the treatment of displacement for red-throated divers advise that whilst red-throated diver displacement within an offshore windfarm footprint may be close to 100%, the rate of change in displacement up to 4 km appears to vary between 55% to 94.5% (SNCB, 2022a). As great northern divers are considered to be less sensitive to disturbance during the non-breeding season compared to red-throated divers (Goodship and Furness, 2022), a displacement rate of 50% to 80% and a mortality rate of 5% was considered appropriate for the great northern diver displacement assessment.

Table 11.20 Displacement and mortality rates used for the displacement assessment.

Species	Displacement Rate	Mortality Rate – Breeding Season	Mortality Rate – Non-breeding season
Great northern diver	50% to 80%	N/A	5%
Kittiwake	30%	1% and 3%	1% and 3%
Arctic tern	30% to 50%	3%	3%
Common tern	30% to 50%	3%	3%
Guillemot	60%	3% and 5%	1% and 3%
Razorbill	60%	3% and 5%	1% and 3%
Puffin	60%	3% and 5%	1% and 3%
Fulmar	20%	1% and 3%	1% and 3%
Gannet	70%	1% and 3%	1% and 3%

288. Following the SNCB (2017; updated 2022) guidance, 'high' and 'low' displacement and mortality rates are presented for each species below.

289. In order to determine the magnitude of impact for each species due to 'low' or 'high' displacement mortality, calculations are made to determine the total annual losses that may occur on the species' regional population (equivalent to the breeding season population, see **Table 11.11**), which may be only a proportion of birds present in the non-breeding season, autumn migration or spring migration periods (refer to species seasons in **Table 11.8**). The ratio of birds from the regional breeding population compared to the total non-breeding season reference population(s) have been agreed with NatureScot and are presented in the respective tables for each species below.

290. The demographic rates (including age at first breeding, productivity mean and SD, adult survival rate mean and SD, and immature survival rates per year mean and SD used for each species are provided in **Technical Appendix 11.7: PVA.**

291. For each species (excluding Arctic tern), a PVA was run twice to assess two different productivity values available in the NE PVA tool (Searle et al., 2019):

- 'Centre for Ecology and Hydrology (CEH)' rates, either 'National' (UK) or 'Scotland'. 'National' rates (mean and SD) were used for Arctic tern, common tern and kittiwake. 'Scotland' rates were used for guillemot and razorbill. The choice of whether to use National or Scotland rates was based on a judgement regarding the robustness and locality of the data. For example, there is very little data available for Arctic tern, common tern and kittiwake, so 'National' rates were considered to be the more robust rates to use, but for auks, there is more data available and therefore applying 'Scotland' rates was considered appropriate;
- A 'local' set of rates, including the 'Minches and Western Scotland' for common tern, kittiwake, great black-backed gull, herring gull, guillemot and razorbill, 'Western Scotland and Eastern Ireland' selected for puffin and 'Irish Seas' selected for gannet.

292. For each species, the PVAs used the same national average survival rates (provided in the NE PVA tool).

293. For Arctic tern, adult productivity rate and adult survival rate were from Horswill and Robinson (2015), sub-adult survival rates are the same as common tern (provided in the NE PVA tool) as these rates are not available for Arctic tern.

11.11.1.7.2.1 Great Northern Diver

11.11.1.7.2.1.1 <u>Sensitivity</u>

294. Great northern diver are assessed to have a medium conservation value and are considered to be of **high** sensitivity to disturbance and displacement due to a high score for disturbance susceptibility and a moderate score for habitat specialisation (SNCB, 2022a).

295. The species was only recorded within the WDA plus 4 km buffer within the non-breeding season with a mean peak of 16 and with no breeding colonies within foraging range. The West Scotland BDMPS population (all ages) is considered by Furness (2015) to be c.2,000 individuals.

11.11.1.7.2.1.2 <u>Impact</u>

296. **Table 11.21** summarises the results of the displacement matrix approach used for great northern diver, as presented in **Technical Appendix 11.4: Displacement**.

297. Under the 'low' displacement mortality scenario (50% displacement and 5% mortality rates) it is predicted that there would be a total annual estimated mortality of 0.4 individuals in the non-breeding BDMPS population due to displacement impacts.

298. Under the 'high' displacement mortality scenario (80% displacement and 5% mortality rates) it is predicted that there would be a total annual estimated mortality of 0.6 individuals in the non-breeding BDMPS population due to displacement impacts.

299. The level of impact of displacement mortality on the survival rate of the regional non-breeding adult population would range from 0.042% (low) to 0.063% (high) (**Table 11.22**).

300. This change is above the 0.02% threshold for a PVA (when rounded up by two decimal places) advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**).

301. With an additional mortality of up to 0.6 individuals the model predicts over 35 years a reduction in growth rate by up to 0.04% (C-PGR = 0.9996) and a reduction in population size by up to 0.67% (C-PS = 0.9933) (**Table 11.23**).

302. Based on the C-PGR predictions, and exemplified by the upper confidence intervals being above 1.0 (indistinguishable change from baseline for both C-PGR and C-PS), this increase in mortality is considered as being of **negligible** magnitude.

11.11.1.7.2.1.3 Significance

303. As the species is of high sensitivity to displacement, with a negligible impact magnitude, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

Table 11.21 Great northern diver seasonal and annual displacement mortality estimates for all birds in flight and on the sea in the WDA plus 4 km buffer.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 4 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Non-breeding season	16	2,000	1.00	0.4	0.40	0.6	0.60
Annual (BDMPS season)					**0.4**		**0.6**

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the BDMPS population impacted in the non-breeding season.

Table 11.22 Impact on great northern diver survival rate resulting from displacement mortality in the WDA plus 4 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional non-breeding population (all indivs.) [1]	Regional non-breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	0.4	960	0.042%	Y
Annual High	0.6		0.063%	Y

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.12**; adult population calculated as 48% of total (Furness 2015).
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

Table 11.23 Projected PVA metrics after 25, 35 and 50 years for great northern diver for the WDA-alone using CEH national rates, adjusted to include correct immature survival values sourced from Piper et al. (*2012*).

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	0.4	0.0002	25	0.9998	0.9998	0.0036	0.9926	1.0069	0.9944	0.9990	0.0986	0.8175	1.2051
High	0.6	0.0003	25	0.9997	0.9996	0.0036	0.9925	1.0067	0.9911	0.9948	0.0976	0.8176	1.1967
Low	0.4	0.0002	35	0.9998	0.9998	0.0033	0.9934	1.0064	0.9937	1.0000	0.1222	0.7768	1.2659
High	0.6	0.0003	35	0.9996	0.9996	0.0033	0.9932	1.0060	0.9848	0.9933	0.1211	0.7729	1.2514
Low	0.4	0.0002	50	0.9999	0.9999	0.0031	0.9938	1.0060	0.9942	1.0082	0.1643	0.7267	1.3631
High	0.6	0.0003	50	0.9998	0.9998	0.0032	0.9936	1.0058	0.9886	1.0001	0.1642	0.7169	1.3554

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

11.11.1.7.2.2 Kittiwake

11.11.1.7.2.2.1 Sensitivity

304. Although kittiwakes have a low disturbance susceptibility and habitat specialisation score (SNCB, 2017; updated 2022; Furness et al., 2013; Bradbury et al., 2017) and are not considered by Natural England to be sensitive to disturbance (see also Trinder et al., 2024 which found no avoidance or attraction behaviour at Beatrice Offshore Wind Farm), this species is assessed to have a medium conservation value. Kittiwakes are therefore considered to have an overall **medium** sensitivity to disturbance and displacement.

305. Kittiwake were recorded in moderate numbers during surveys. In general, kittiwake counts were highest in the non-breeding seasons with an estimated mean peak abundance in the WDA plus 2 km buffer of 5,654 in autumn, 3,489 in spring and 1,221 in the breeding season.

306. The mean maximum foraging range (+1SD) for kittiwake is 300.6 km (**Table 11.10**) which places the WDA within theoretical potential foraging range of 13 SPA kittiwake breeding colonies (refer to the **RIAA** for details on regional breeding composition for each species). Although a large proportion of the regional breeding population is associated with SPAs, some other non-SPA populations are also likely to contribute to individuals at risk. The total regional population size is estimated to be 97,366 adult individuals (**Table 11.11**).

11.11.1.7.2.2.2 Impact

307. **Table 11.24** summarises the results of the displacement matrix approach used for kittiwake, as presented in **Technical Appendix 11.4: Displacement**.

308. Under the 'low' displacement mortality scenario (30% displacement and 1% mortality rates) it is predicted that there would be a total annual estimated mortality of 31.2 individuals due to displacement impacts. When considering the impact on the regional population only, the predicted mortality is reduced to 10.6 individuals (**Table 11.24**).

309. Under the 'high' displacement mortality scenario (30% displacement and 3% mortality rates) it is predicted that there would be a total annual estimated mortality of 93.3 individuals due to displacement impacts. When considering the impact on the regional population only, the annual mortality is reduced to 31.7 individuals **(Table 11.24**).

310. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.005% (low) to 0.016% (high) (**Table 11.25**).

311. This change is above the 0.02% threshold for a PVA (when rounded up by two decimal places) advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

312. With an additional mortality of up to 31.7 individuals the model predicts over 35 years a reduction in growth rate by up to 0.02% (C-PGR = 0.9998) and a reduction in population size by up to 0.67% (C-PS = 0.9933) when using the national demographic rates (**Table 11.26**).

313. Based on the C-PGR predictions and exemplified by the upper confidence intervals being above 1.0 (indistinguishable change from baseline), this magnitude of increase in mortality is considered as being of **negligible** magnitude.

11.11.1.7.2.2.3 Significance

314. As the species is of **medium** sensitivity to displacement, with a negligible impact magnitude, the effect significance is **negligible**, which is **not significant** in EIA terms.

Table 11.24 Kittiwake seasonal and annual displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	1,221	204,122	1.00	3.7	3.70	11.0	11.00
BDMPS Spring migration	3,489	691,526	0.30	10.5	3.10	31.4	9.27
BDMPS Autumn migration	5,654	911,586	0.22	17.0	3.81	50.9	11.40
Annual (Breeding + BDMPS seasons)					10.6		31.7

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.25 Impact on kittiwake survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.) [1]	Regional breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	10.6	204,122	0.005%	N
Annual High	31.7		0.016%	Y

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

Table 11.26 Projected PVA metrics after 25, 35 and 50 years for kittiwake for the WDA-alone using CEH National Demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	10.6	0.0000520	25	0.9999	0.9999	0.0003	0.9994	1.0005	0.9985	0.9984	0.0085	0.9819	1.0152
High	31.7	0.0001551	25	0.9998	0.9998	0.0003	0.9993	1.0003	0.9952	0.9952	0.0085	0.9783	1.0118
Low	10.6	0.0000520	35	0.9999	0.9999	0.0002	0.9995	1.0004	0.9978	0.9978	0.0093	0.9792	1.0162
High	31.7	0.0001551	35	0.9998	0.9998	0.0002	0.9994	1.0002	0.9933	0.9933	0.0091	0.9750	1.0116
Low	10.6	0.0000520	50	1.0000	1.0000	0.0002	0.9996	1.0003	0.9978	0.9979	0.0101	0.9783	1.0180
High	31.7	0.0001551	50	0.9999	0.9999	0.0002	0.9995	1.0002	0.9932	0.9932	0.0100	0.9734	1.0129

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

Table 11.27 Projected PVA metrics after 25, 35 and 50 years for kittiwake for the WDA-alone using Regional Minches and West Scotland rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	10.6	0.0000520	25	0.9999	0.9999	0.0002	0.9995	1.0004	0.9984	0.9984	0.0077	0.9830	1.0137
High	31.7	0.0001551	25	0.9998	0.9998	0.0002	0.9994	1.0002	0.9951	0.9952	0.0076	0.9809	1.0107
Low	10.6	0.0000520	35	0.9999	0.9999	0.0002	0.9996	1.0003	0.9978	0.9977	0.0081	0.9816	1.0141
High	31.7	0.0001551	35	0.9998	0.9998	0.0002	0.9995	1.0002	0.9931	0.9934	0.0081	0.9779	1.0096
Low	10.6	0.0000520	50	1.0000	1.0000	0.0001	0.9997	1.0002	0.9978	0.9977	0.0087	0.9802	1.0152
High	31.7	0.0001551	50	0.9999	0.9999	0.0001	0.9996	1.0001	0.9933	0.9933	0.0086	0.9767	1.0106

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

11.11.1.7.2.3 Arctic Tern

11.11.1.7.2.3.1 Sensitivity

315. Arctic terns are assessed to have a medium conservation value and an overall **medium** sensitivity to disturbance and displacement based on their disturbance susceptibility and habitat specialisation (SNCB, 2022; Furness et al., 2013; Bradbury et al., 2017).

316. Arctic tern were only recorded between April and September, with a mean peak in the WDA plus 2 km buffer in May (classed as both spring and breeding seasons) of 91 and an autumn mean peak of 35.

317. The mean maximum foraging range (+1SD) for Arctic tern is 40.5 km (**Table 11.10**) which places the WDA beyond potential foraging range of any SPA Arctic tern breeding colonies, although other non-SPA populations may contribute to individuals at risk. The total breeding season regional population size is estimated to be 1,468 adult individuals (**Table 11.11**).

11.11.1.7.2.3.2 Impact

318. **Table 11.28** summarises the results of the displacement matrix approach used for Arctic tern, as presented in **Technical Appendix 11.4: Displacement**.

319. Under the 'low' displacement mortality scenario (30% displacement and 3% mortality rates) it is predicted that there would be a total annual estimated mortality of 1.9 individuals due to displacement impacts. When considering the regional population only, the predicted mortality is reduced to 0.8 individuals.

320. Under the 'high' displacement mortality scenario (50% displacement and 3% mortality rates) it is predicted that there would be a total annual estimated mortality of 3.3 individuals due to displacement impacts. When considering the regional population only, the annual mortality is reduced to 1.5 individuals.

321. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.036% (low) to 0.063% (high) (**Table 11.29**). This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

322. With an additional mortality of up to 1.5 individuals the model predicts over 35 years a reduction in growth rate by up to 0.08% (C-PGR = 0.9992) and an indistinguishable change in population size (C-PS = 1.0456) (**Table 11.30**).

323. Based on the C-PGR predictions, this magnitude of increase in mortality is considered as being of **negligible** magnitude.

11.11.1.7.2.3.3 Significance

324. As the species is of medium sensitivity to displacement, with a negligible impact magnitude, the effect significance is **negligible**, which is **not significant** in EIA terms.

Table 11.28 Arctic tern seasonal and annual displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	91.4	2,330	1.00	0.8	0.80	1.4	1.40
BDMPS Spring migration	91.4	71,398	0.03	0.8	0.03	1.4	0.05
BDMPS Autumn migration	35.2	71,398	0.03	0.3	0.01	0.5	0.02
Annual (Breeding + BDMPS seasons)					0.8		1.5

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.29 Impact on Arctic tern survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.) [1]	Regional breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	0.8	2,330	0.036%	Y
Annual High	1.5		0.063%	Y

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

Table 11.30 Projected PVA metrics after 25, 35 and 50 years for Arctic tern for the WDA-alone using CEH National Demographic rates.

Scenario	Impact	Increase in mortality	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	0.8	0.0003588	25	0.9993	0.9992	0.0088	0.9816	1.0163	0.9826	1.0087	0.2440	0.6056	1.5601
High	1.5	0.0006275	25	0.9989	0.9989	0.0089	0.9811	1.0166	0.9714	0.9992	0.2435	0.6013	1.5418
Low	0.8	0.0003588	35	0.9992	0.9993	0.0103	0.9783	1.0198	0.9731	1.0489	0.4363	0.4531	2.1001
High	1.5	0.0006275	35	0.9992	0.9992	0.0104	0.9781	1.0194	0.9697	1.0456	0.4525	0.4500	2.0278
Low	0.8	0.0003588	50	0.9994	0.9917	0.0894	0.9656	1.0285	1.0000	1.2704	1.3404	0.1667	4.2250
High	1.5	0.0006275	50	0.9994	0.9908	0.0927	0.9662	1.0274	0.9630	1.2612	1.4194	0.1695	4.0000

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

11.11.1.7.2.4 Common Tern

11.11.1.7.2.4.1 Sensitivity

325. Common terns are assessed to have a medium conservation value and to have an overall **medium** sensitivity to disturbance and displacement based on their disturbance susceptibility and habitat specialisation (SNCB, 2022; Furness et al., 2013; Bradbury et al., 2017).

326. Common tern were only recorded between April and September, with a mean peak in the WDA plus 2 km buffer in August (classed as both autumn and breeding seasons) of 63 and none recorded in spring.

327. The mean maximum foraging range (+1SD) for common tern is 26.9 km (**Table 11.10**) which places the WDA beyond potential foraging range of any SPA common tern breeding colonies, although other non-SPA populations may contribute to individuals at risk. The total breeding season regional population size is estimated to be 42 adult individuals (**Table 11.11**).

11.11.1.7.2.4.2 Impact

328. **Table 11.31** summarises the results of the displacement matrix approach used for common tern, as presented in **Technical Appendix 11.4: Displacement**.

329. Under the 'low' displacement mortality scenario (30% displacement and 3% mortality rates) it is predicted that there would be a total annual estimated mortality of 1.2 individuals due to displacement impacts. When considering the regional population only, the predicted mortality is reduced to 0.6 individuals.

330. Under the 'high' displacement mortality scenario (50% displacement and 3% mortality rates) it is predicted that there would be a total annual estimated mortality of 1.8 individuals due to displacement impacts. When considering the regional population only, the annual mortality is reduced to 0.9 individuals.

331. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.858% (low) to 1.287% (high) (**Table 11.32**). This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

332. With an additional mortality of up to 0.9 individuals the model predicts over 35 years a reduction in growth rate by up to 6.14% (C-PGR = 0.9386) for the Minches and West Scotland demographic rates compared to 2.02% (C-PGR = 0.9798) using the CEH national demographic rates (**Table 11.33** and **Table 11.34**).

333. The reduction in population size is predicted to be by up to 13.25% (C-PS = 0.8675) using the Minches and West Scotland demographic rates and up to 29.51% (C-PS = 0.7049) for the CEH national demographic rates.

334. These reductions from the baseline appear relatively large, however a number of factors should be considered for determining magnitude of impact:

- The regional population is very small, at 42 adult individuals. This means that relatively small impacts (e.g. up to one individual being lost to the population every year) would materially affect the growth rate and population size over the long-term;
- The small population size also means that the PVA modelling is less robust than when dealing with larger populations. For example, there is a broad range between lower and upper confidence intervals, with upper confidence intervals greater than 1.0 for both C-PGR and C-PS, suggesting that the applicability of the model is limited;

- It was also the case that raw counts for the species within the WDA plus 2 km buffer were low, with a total of 27 positively identified individuals observed across all surveys. Arctic tern counts were higher (116 individuals), with a total of 80 'commic' tern observations. It is therefore possible that the ratio used for apportioning commic terns to a species level may be misleading due to the low sample size;
- The peak monthly abundance during the breeding season was estimated as being 126 individuals (August 2021), with a peak mean of 63 individuals during the breeding season. This peak mean is greater than the regional adult breeding population (42 individuals), indicating that impacts on the regional population during the breeding season may be overestimated, particularly if it is assumed that one adult would be tending an active nest at all times.

335. Overall, therefore, whilst acknowledging that the regional breeding population is small, and, if following national trends, likely to be subject to threats such as climate change, it is likely that in absolute terms, the number of individuals impacted, and frequency of impact occurrence due to the Project is likely to be very small. The magnitude of increase in mortality on the regional breeding population is therefore considered to be **low**.

11.11.1.7.2.4.3 Significance

336. As the species is of medium sensitivity to displacement, with a low impact magnitude, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

Table 11.31 Common tern seasonal and annual displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	63	70	1.00	0.6	0.60	0.9	0.90
BDMPS Spring migration	0	64,659	0.001	0.0	0.00	0	0.00
BDMPS Autumn migration	63	64,659	0.001	0.6	0.001	0.9	0.001
Annual (Breeding + BDMPS seasons)					0.6		0.9

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.32 Impact on common tern survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.)[1]	Regional breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	0.6	70	0.858%	Y
Annual High	0.9		1.287%	Y

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

Table 11.33 Projected PVA metrics after 25, 35 and 50 years for common tern for the WDA-alone using the CEH national demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	0.6	0.0085807	25	0.9892	0.9889	0.0238	0.9501	1.0277	0.7429	0.8951	0.6778	0.2192	2.5014
High	0.9	0.0128711	25	0.9840	0.9831	0.0278	0.9429	1.0206	0.6581	0.7758	0.6031	0.1788	2.0527
Low	0.6	0.0085807	35	0.9894	0.9868	0.0475	0.9521	1.0227	0.6761	0.8481	0.8451	0.1362	2.6506
High	0.9	0.0128711	35	0.9840	0.9798	0.0615	0.9444	1.0165	0.5545	0.7049	0.8124	0.1095	2.1460
Low	0.6	0.0085807	50	0.9920	0.9805	0.1066	0.9531	1.0215	0.6590	0.9600	1.7285	0.0746	3.5000
High	0.9	0.0128711	50	0.9879	0.9729	0.1206	0.9423	1.0174	0.5271	0.7800	1.2922	0.0433	2.7098

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

Table 11.34 Projected PVA metrics after 25, 35 and 50 years for common tern for the WDA-alone using the Minches and West Scotland demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	0.6	0.0085807	25	0.9904	0.9844	0.0798	0.9302	1.0436	0.7805	1.0479	1.1711	0.1304	3.5517
High	0.9	0.0128711	25	0.9834	0.9725	0.1072	0.9150	1.0395	0.6486	0.9036	1.1987	0.0791	3.1696
Low	0.6	0.0085807	35	0.9895	0.9610	0.1678	0.0000	1.0365	0.6923	1.0484	1.6569	0.0000	4.0000
High	0.9	0.0128711	35	0.9823	0.9386	0.2068	0.0000	1.0349	0.5294	0.8675	1.5016	0.0000	3.6533
Low	0.6	0.0085807	50	0.9906	0.8903	0.3033	0.0000	1.0349	0.6154	1.2014	2.3294	0.0000	6.0000
High	0.9	0.0128711	50	0.9841	0.8411	0.3526	0.0000	1.0313	0.4444	0.9368	1.8921	0.0000	5.0000

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

11.11.1.7.2.5 Guillemot

11.11.1.7.2.5.1 Sensitivity

337. Guillemots are assessed to have a medium conservation value and have a **medium** sensitivity to disturbance and displacement based on their disturbance susceptibility and habitat specialisation (SNCB, 2022; Furness et al., 2013; Bradbury et al., 2017).

338. Guillemots were recorded in large numbers during surveys. In general, guillemot counts were highest in the breeding season with an estimated mean peak abundance of 27,095 guillemots, including apportioned birds, in the WDA plus 2 km buffer. Abundance was more variable during the non-breeding season, albeit there was a similar estimated mean peak of 28,532 in the WDA plus 2 km buffer.

339. The mean maximum foraging range (+1SD) for guillemot is 95.2 km which places the WDA within the potential foraging range of four SPA guillemot breeding colonies, although other non-SPA populations are also likely to contribute to individuals at risk. The total breeding season regional population size is estimated to be 260,944 adult individuals (**Table 11.11**). As agreed with NatureScot, it has been assumed that all remaining individuals present during the non-breeding season are from the breeding population (i.e. ratio used is 1.0).

11.11.1.7.2.5.2 Impact

340. **Table 11.35** summarises the results of the displacement matrix approach used for guillemot, as presented in **Technical Appendix 11.4: Displacement**.

341. Under the 'low' displacement mortality scenario (60% displacement rate and 3% breeding season and 1% non-breeding season mortality rates) it is predicted that there would be a total estimated annual mortality of 658.9 individuals due to displacement impacts.

342. Under the 'high' displacement mortality scenario (60% displacement rate and 5% breeding season and 3% non-breeding season mortality rates) it is predicted that there would be a total estimated annual mortality of 1,326.5 individuals due to displacement impacts.

343. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.134% (low) to 0.269% (high) (**Table 11.36**). This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

344. With an additional mortality of up to 1,326.5 individuals the model predicts over 35 years a reduction in growth rate by up to 0.3% (C-PGR = 0.9970) and a reduction in population size by up to 10.3% (C-PS = 0.8969), using Minches and West Scotland demographic rates (**Table 11.38**). Based on the C-PGR predictions, this magnitude of increase in mortality is considered as being of **low** magnitude.

11.11.1.7.2.5.3 Significance

345. As the species is of medium sensitivity to displacement, with a low impact magnitude, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

Table 11.35 Common guillemot seasonal and annual displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km.

Season	**Mean Seasonal Peak abundance (all birds in WDA** plus 2 km buffer)	**Reference population (including sabbatical adults and all sub-adult ages)**	**Ratio of birds from the regional population compared to the BDMPS non-breeding population**	**Estimated total seasonal LOW displacement mortality**[1]	**Low displacement mortalities used to calculate annual mortality**[2]	**Estimated total seasonal HIGH displacement mortality**[1]	**High displacement mortalities used to calculate annual mortality**[2]
Breeding season	27,095	492,254	1.00	487.7	487.70	812.9	812.90
Non-breeding season	28,531	492,254	1.00	171.2	171.20	513.6	513.60
Annual (Breeding + BDMPS seasons)					658.9		1326.5

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.36 Impact on common guillemot survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	**Estimated annual displacement mortality within regional breeding population (all indivs.)** [1]	**Regional breeding population (all individuals)**[2]	**Additional impact on survival rate**[3]	**PVA required (Y/N)**[4]
Annual Low	658.9	492,254	0.134%	Y
Annual High	1326.5		0.269%	Y

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

Table 11.37 Projected PVA metrics after 25, 35 and 50 years for common guillemot for the WDA-alone using the CEH national demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	658.9	0.0013385	25	0.9985	0.9985	0.0001	0.9983	0.9987	0.9617	0.9618	0.0034	0.9550	0.9684
High	1,326.5	0.0026947	25	0.9970	0.9970	0.0001	0.9968	0.9972	0.9246	0.9246	0.0033	0.9181	0.9310
Low	658.9	0.0013385	35	0.9985	0.9985	0.0001	0.9983	0.9987	0.9475	0.9475	0.0036	0.9403	0.9546
High	1,326.5	0.0026947	35	0.9970	0.9970	0.0001	0.9968	0.9972	0.8972	0.8972	0.0035	0.8904	0.9040
Low	658.9	0.0013385	50	0.9989	0.9989	0.0001	0.9988	0.9991	0.9475	0.9475	0.0039	0.9395	0.9552
High	1,326.5	0.0026947	50	0.9979	0.9979	0.0001	0.9977	0.9980	0.8972	0.8972	0.0038	0.8897	0.9045

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

Table 11.38 Projected PVA metrics after 25, 35 and 50 years for common guillemot for the WDA-alone using the Minches and West Scotland demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	658.9	0.0013385	25	0.9985	0.9985	0.0001	0.9983	0.9987	0.9617	0.9617	0.0031	0.9556	0.9680
High	1,326.5	0.0026947	25	0.9970	0.9970	0.0001	0.9968	0.9972	0.9245	0.9244	0.0031	0.9183	0.9305
Low	658.9	0.0013385	35	0.9985	0.9985	0.0001	0.9983	0.9986	0.9474	0.9474	0.0033	0.9408	0.9540
High	1,326.5	0.0026947	35	0.9970	0.9970	0.0001	0.9968	0.9971	0.8968	0.8968	0.0032	0.8907	0.9032
Low	658.9	0.0013385	50	0.9989	0.9989	0.0001	0.9988	0.9991	0.9474	0.9474	0.0035	0.9404	0.9545
High	1,326.5	0.0026947	50	0.9979	0.9979	0.0001	0.9977	0.9980	0.8968	0.8969	0.0034	0.8903	0.9035

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

11.11.1.7.2.6 Razorbill

11.11.1.7.2.6.1 Sensitivity

346. Razorbills (including apportioned and dive bias corrected birds) were recorded in moderate numbers during surveys. Counts were generally higher in the BDMPS non-breeding seasons, with a peak raw count of 1,687, including apportioned birds, in the WDA plus 4 km in November 2022. A peak raw count of 1,191 was recorded during the breeding season, in July 2022.

347. Razorbills were recorded in moderate numbers during surveys. In general, abundance was highest in the non-breeding seasons with an estimated mean peak abundance in the WDA plus 2 km buffer of 6,951 in spring, 5,198 in winter, 3,092 in autumn and 2,636 in the breeding season.

348. Razorbills are assessed to have a medium conservation value and are assessed to have a **medium** sensitivity to disturbance and displacement based on their disturbance susceptibility and habitat specialisation (SNCB, 2022; Furness et al., 2013; Bradbury et al., 2017).

349. The mean maximum foraging range (+1SD) for razorbill (excluding Northern Isles colonies) is 122.2 km which places the WDA within the potential foraging range of two SPA razorbill breeding colonies (Mingulay and Bernaray SPA and Rathlin Island SPA), although other non-SPA populations are also likely to contribute to individuals at risk, including Rinns of Islay Ramsar site.

11.11.1.7.2.6.2 Impact

350. **Table 11.39** summarises the results of the displacement matrix approach used for razorbill, as presented in **Technical Appendix 11.4: Displacement**.

351. Under the 'low' displacement mortality scenario (60% displacement rate and 3% breeding season and 1% non-breeding season mortality rates) it is predicted that there would be a total annual estimated mortality of 138.9 individuals due to displacement impacts. When considering the regional population only, the predicted mortality is reduced to 74.1 individuals.

352. Under the 'high' displacement mortality scenario (60% displacement rate and 5% breeding season and 3% non-breeding season mortality rates) it is predicted that there would be a total annual estimated mortality of 353.5 individuals due to displacement impacts. When considering the regional population only, the annual mortality is reduced to 159.3 individuals.

353. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.064% (low) to 0.137% (high) (**Table 11.40**). This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

354. With an additional mortality of up to 159.3 individuals the model predicts over 35 years a reduction in growth rate by up to 0.13% (C-PGR = 0.9987) and a reduction in population size by up to 4.5% (C-PS = 0.9546), using either set of demographic rates (CEH Scotland or local Minches and Western Scotland (**Table 11.41** and **Table 11.42**). Based on the C-PGR predictions, this magnitude of increase in mortality is considered as being of **low** magnitude.

11.11.1.7.2.6.3 Significance

355. As the species is of medium sensitivity to displacement, with a low impact magnitude, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

Table 11.39 Razorbill seasonal and annual displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	2,636	140,198	1.00	47.4	47.40	79.1	79.10
BDMPS Spring migration	6,951	606,914	0.23	41.7	9.63	125.1	28.90
BDMPS Autumn migration	3,092	606,914	0.23	18.6	4.30	55.7	12.87
BDMPS Winter	5,198	341,422	0.41	31.2	12.81	93.6	38.43
Annual (Breeding + BDMPS seasons)					74.1		159.3

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.40 Impact on razorbill survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.) [1]	Regional breeding population (adult individuals)[2]	Additional impact on adult survival rate[3]	PVA required (Y/N)[4]
Annual Low	74.1	66,392	0.064%	Y
Annual High	159.3		0.137%	Y

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

Table 11.41 Projected PVA metrics after 25, 35 and 50 years for razorbill for the WDA-alone using the CEH national demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	74.1	0.0005288	25	0.9994	0.9994	0.0003	0.9987	1.0000	0.9842	0.9843	0.0100	0.9643	1.0042
High	159.3	0.0011363	25	0.9987	0.9987	0.0003	0.9981	0.9994	0.9671	0.9670	0.0098	0.9479	0.9867
Low	74.1	0.0005288	35	0.9994	0.9994	0.0003	0.9988	0.9999	0.9783	0.9785	0.0114	0.9559	1.0011
High	159.3	0.0011363	35	0.9987	0.9987	0.0003	0.9981	0.9993	0.9546	0.9546	0.0112	0.9325	0.9768
Low	74.1	0.0005288	50	0.9996	0.9996	0.0002	0.9991	1.0001	0.9785	0.9786	0.0136	0.9523	1.0054
High	159.3	0.0011363	50	0.9991	0.9991	0.0003	0.9986	0.9996	0.9547	0.9548	0.0134	0.9287	0.9817

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

Table 11.42 Projected PVA metrics after 25, 35 and 50 years for razorbill for the WDA-alone using the Minches and West Scotland demographic rates.

Scenario	Impact	Increase in mortality rate	Timeframe (years)	Counterfactual of Growth Rate					Counterfactual of Population Size				
				Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Low	74.1	0.0005288	25	0.9994	0.9994	0.0003	0.9988	0.9999	0.9844	0.9845	0.0088	0.9674	1.0018
High	159.3	0.0011363	25	0.9987	0.9987	0.0003	0.9981	0.9993	0.9671	0.9671	0.0087	0.9500	0.9846
Low	74.1	0.0005288	35	0.9994	0.9994	0.0002	0.9989	0.9998	0.9786	0.9786	0.0096	0.9597	0.9978
High	159.3	0.0011363	35	0.9987	0.9987	0.0002	0.9982	0.9992	0.9546	0.9546	0.0096	0.9360	0.9735
Low	74.1	0.0005288	50	0.9996	0.9996	0.0002	0.9992	1.0000	0.9783	0.9786	0.0109	0.9577	1.0005
High	159.3	0.0011363	50	0.9991	0.9991	0.0002	0.9987	0.9995	0.9546	0.9547	0.0107	0.9342	0.9767

* SD = standard deviation, LCI = lower confidence interval, UCI = upper confidence interval.

11.11.1.7.2.7 Puffin

11.11.1.7.2.7.1 <u>Sensitivity</u>

356. Puffins were recorded in relatively low numbers during surveys. While most puffins were recorded in the WDA plus 2 km buffer in the breeding season, with a mean peak abundance of 972, August was the month with the highest numbers observed, which falls in the non-breeding season with mean peak abundance of 1,192.

357. Puffins are assessed to have a medium conservation value and to have a **medium** sensitivity to disturbance and displacement based on their disturbance susceptibility and habitat specialisation (SNCB, 2022; Furness et al., 2013; Bradbury et al., 2017).

358. The mean maximum foraging range (+1SD) for puffin is 265.4 km (**Table 11.10**) which places the WDA within the potential foraging range of five UK SPA puffin breeding colonies, although other non-SPA populations are also likely to contribute to individuals at risk.

11.11.1.7.2.7.2 <u>Impact</u>

359. **Table 11.43** and **Table 11.44** summarise the results of the displacement matrix approach used for puffin, as presented in **Technical Appendix 11.4: Displacement**. As the total breeding reference population is larger than the total non-breeding reference population, it has been assumed that all remaining individuals present during the non-breeding season are from the breeding population (i.e. ratio used is 1.0).

360. Under the 'low' displacement mortality scenario (60% displacement rate and 3% breeding season and 1% non-breeding season mortality rates) it is predicted that there would be an estimated total annual mortality of 24.7 individuals due to displacement impacts.

361. Under the 'high' displacement mortality scenario (60% displacement rate and 5% breeding season and 3% non-breeding season mortality rates) it is predicted that there would be an estimated total annual mortality of 50.6 individuals due to displacement impacts.

362. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.003% (low) to 0.006% (high; **Table 11.44**). This change falls below the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and is considered to be of **negligible** magnitude of impact.

11.11.1.7.2.7.3 <u>Significance</u>

363. As the species is of medium sensitivity to displacement, with a negligible impact magnitude, the effect significance is **negligible**, which is **not significant** in EIA terms.

Table 11.43 Puffin seasonal displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer by season, and total annual.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	972	903,609	1.00	17.5	17.50	29.1	29.10
Non-breeding season	1,192	304,557	1.00	7.2	7.20	21.5	21.50
Annual (Breeding + BDMPS seasons)					24.7		50.6

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.44 Impact on puffin survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.) [1]	Regional breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	24.7	903,609	0.003%	N
Annual High	50.6		0.006%	N

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

11.11.1.7.2.8 Fulmar

11.11.1.7.2.8.1 Sensitivity

364. Fulmar were recorded in relatively low numbers throughout the year. The mean peak abundance in the WDA plus 2 km buffer in the breeding season was 83, in autumn was 55, winter 53 and spring 138.

365. Although fulmar has a low disturbance susceptibility and habitat specialisation score (SNCB, 2022; Furness et al., 2013; Bradbury et al., 2017), the species may be susceptible to barrier effects. Fulmar is assessed to have a medium conservation value. The species is therefore assessed as having an overall **medium** sensitivity to disturbance and displacement.

366. The mean maximum foraging range (+1SD) for fulmar is 1,200.2 km (**Table 11.10**) which places the WDA within the potential foraging range of 23 UK SPA fulmar breeding colonies, although some Republic of Ireland SPAs and other non-SPA populations are also likely to contribute to individuals at risk.

11.11.1.7.2.8.2 Impact

367. **Table 11.45** and **Table 11.46** summarise the results of the displacement matrix approach used for fulmar, as presented in **Technical Appendix 11.4: Displacement**. As the total breeding reference population is larger than the total non-breeding reference population, it has been assumed that all remaining individuals present during the non-breeding season are from the breeding population (i.e. ratio used is 1.0).

368. Under the 'low' displacement mortality scenario (20% displacement rate and 1% mortality rate) it is predicted that there would be a total annual estimated mortality of 0.7 individuals due to displacement impacts.

369. Under the 'high' displacement mortality scenario (20% displacement rate and 3% mortality rate) it is predicted that there would be a total annual estimated mortality of 1.9 individuals due to displacement impacts.

370. The level of impact of displacement mortality on the survival rate of the regional adult population would be <0.001% for both low and high mortality scenarios. This change falls below the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and is considered to be of **negligible** magnitude of impact.

11.11.1.7.2.8.3 Significance

371. As the species is of medium sensitivity to displacement, with a negligible impact magnitude, the effect significance is **negligible**, which is **not significant** in EIA terms.

Table 11.45 Fulmar seasonal displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer by season, and total annual.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	83	1,075,171	1.00	0.2	0.20	0.5	0.50
BDMPS Spring migration	138	828,194	1.00	0.3	0.30	0.8	0.80
BDMPS Autumn migration	55	828,194	1.00	0.1	0.10	0.3	0.30
BDMPS Winter	53	556,367	1.00	0.1	0.10	0.3	0.30
Annual (Breeding + BDMPS seasons)		0.7				1.9	

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.46 Impact on fulmar survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.) [1]	Regional breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	0.7	1,075,171	0.0001%	N
Annual High	1.9		0.0002%	N

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

11.11.1.7.2.9 Gannet

11.11.1.7.2.9.1 Sensitivity

372. Although gannets have a low disturbance susceptibility and habitat specialisation score (SNCB, 2022; Furness et al., 2013, Bradbury et al., 2017), this species is assessed to have a medium conservation value. Gannets are therefore assessed to have an overall **medium** sensitivity to disturbance and displacement.

373. Gannet were recorded in moderate numbers during surveys. In general, abundance was highest in the breeding season with an estimated mean peak abundance in the WDA plus 2 km buffer of 423, with mean peak abundances of 152 in autumn and 139 in spring.

374. The general mean maximum foraging range (+1SD) for gannet is 509.4 km (exceptions apply to Forth Islands SPA, Grassholm SPA and St Kilda SPA; **Table 11.10**) which places the WDA within the potential foraging range of five UK SPA gannet breeding colonies, although other non-SPA populations are also likely to contribute to individuals at risk.

11.11.1.7.2.9.2 Impact

375. **Table 11.47** and **Table 11.48** summarise the results of the displacement matrix approach used for gannet, as presented in **Technical Appendix 11.4: Displacement**.

376. Under the 'low' displacement mortality scenario (70% displacement rate and 1% mortality rate) it is predicted that there would be a total annual estimated mortality of 5.1 individuals due to displacement impacts. When considering the regional population only, the predicted mortality is reduced to 5.0 individuals.

377. Under the 'high' displacement mortality scenario (70% displacement rate and 3% mortality rate) it is predicted that there would be a total annual estimated mortality of 15.0 individuals due to displacement impacts. When considering the regional population only, the predicted mortality is reduced to 14.6 individuals.

378. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.001% (low) to 0.003% (high)Table 11.48. This change falls below the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and is considered to be of **negligible** magnitude of impact.

11.11.1.7.2.9.3 Significance

379. As the species is of medium sensitivity to displacement, with a negligible impact magnitude, the effect significance is **negligible**, which is **not significant** in EIA terms.

Table 11.47 Gannet seasonal displacement mortality estimates for all birds in flight and on the sea in the WDA plus 2 km buffer by season, and total annual.

Season	Mean Seasonal Peak abundance (all birds in WDA plus 2 km buffer)	Reference population (including sabbatical adults and all sub-adult ages)	Ratio of birds from the regional population compared to the BDMPS non-breeding population	Estimated total seasonal LOW displacement mortality[1]	Low displacement mortalities used to calculate annual mortality[2]	Estimated total seasonal HIGH displacement mortality[1]	High displacement mortalities used to calculate annual mortality[2]
Breeding season	423	566,327	1.00	3.0	3.00	8.9	8.90
BDMPS Spring migration	139	661,888	0.86	1.0	0.86	2.9	2.48
BDMPS Autumn migration	152	545,954	1.00	1.1	1.10	3.2	3.20
Annual (Breeding + BDMPS seasons)		5.0				14.6	

1. Displacement mortality of all individuals, as derived from matrix table.
2. Displacement mortality of the regional population impacted in the non-breeding season, spring migration and/or autumn migration periods (a proportion of the reference population). Calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal displacement mortality.

Table 11.48 Impact on gannet survival rate resulting from displacement mortality in the WDA plus 2 km buffer.

Displacement Scenario	Estimated annual displacement mortality within regional breeding population (all indivs.) [1]	Regional breeding population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Annual Low	5.0	566,327	0.001%	N
Annual High	14.6		0.003%	N

1. Displacement mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are presented in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as: *displacement mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >= 0.02%, when rounded up to two decimal places.

11.11.1.7.3 Displacement due to Vessel Movements to and from Ports

380. The information relating to sensitivities of species to vessel disturbance, outlined in Impact 1, remains equally applicable for vessel movements during the O&M phase, and is therefore not repeated here, with the exception of great northern diver with **high** sensitivity, all other assessed species were identified as **medium** sensitivity.

381. Vessel trips and numbers are likely to be much smaller than during the O&M phase, and limited to maintenance activities and supply vessels. Any displacement would be temporary and very localised in extent, and the magnitude of impact for all IOFs is considered to be **negligible**.

382. As a consequence, the level of significance of displacement due to vessels is considered to be **negligible** and **not significant** in EIA terms.

11.11.1.8 Impact 5: Collision Risk

383. The method used to assess collision risk associated with the Project follows NatureScot's Guidance Note #7: *Guidance to support Offshore Wind Applications: Marine Ornithology - Advice for assessing collision risk of marine birds*. As agreed with NatureScot at the ETG Meeting 4 (2 December 2025) an 'R' software script version of the online stochastic collision risk model (sCRM) tool (Caneco, 2022) was used to estimate collisions for birds in flight within the WDA. Information on the sCRM, data inputs and all collision mortality outputs are presented in **Appendix 11.3: Collision Risk Modelling**.

384. Quantitative collision risk for migratory species is assessed separately to marine bird species. Migratory species were assessed using the Scottish Government's sCRM for migratory species recommended in NatureScot's Guidance Note #7. Details of the model and results for migratory species are presented in **Annex 11.3D: Migratory Collision Risk Modelling**.

11.11.1.8.1 Seabird IOFs

385. Based on the guidance and results of analysis of the baseline surveys (**Annex 11.3A: Bootstrapped density inputs to sCRM**), consultation with NatureScot led to agreement that collision risk assessment was required for six seabird species:

- Kittiwake;
- Great black-backed gull;
- Arctic tern;
- Common tern;
- Herring gull; and
- Gannet.

386. These six seabird species are considered to be vulnerable to colliding with turbines (Furness et al., 2013).

387. Other gull species, including black-headed gull, common gull, and lesser black-backed gull are all considered to be at risk of colliding with WTGs (Furness et al., 2013). However, no collision risk modelling was undertaken for these gull species as they were either not observed or recorded at very low densities in the WDA. In the 29 DAS samples used for collision risk modelling (refer to **Technical Appendix 11.2: Baseline Site Characterisation**), no black-headed gull or lesser black-backed gull individuals were recorded in flight in the WDA and therefore there is no collision risk associated with these species. Six common gull individuals were recorded in flight in the WDA in five surveys (a maximum of two common gull individuals recorded in any one survey, refer to **Annex 11.2E: Raw Counts**). Any common gull collision mortality would be so small that no collision risk modelling would be informative for this species.

388. Arctic skua and great skua are also considered to be at risk of colliding with WTGs (Furness et al., 2013). However, no collision risk modelling was undertaken for either of these skua species as they were recorded at very low densities in the WDA. In the 29 DAS samples used for collision risk modelling, four Arctic skua individuals were recorded over three surveys (maximum of two individuals per survey, **Annex 11.2E: Raw Counts**) and nine great skua individuals were recorded over six surveys (maximum of four individuals per survey, **Annex 11.2E: Raw Counts**). Any skua collision mortality would be so small that no collision risk modelling would be informative for these two species.

389. Avoidance rates used in modelling followed NatureScot guidance (NatureScot Guidance Note 7, version 3 updated April 2025). These rates are presented in **Table 11.49**.

390. Collision estimates for the six seabird species under the ‘WCS’ design and the ‘MLS’ design are presented in the following sections. Both have used Option 2 of the sCRM tool (using the generic flight height dataset).

Table 11.49 Species biometrics used in stochastic CRMs to generate collision estimates. All values are provided in NatureScot Guidance Note #7 (Appendix 1, Table 2) unless otherwise stated.

Species	Stochastic CRM Avoidance Rate - mean (SD)	Flight speed mean (m/s) (SD)	Nocturnal Activity Factor mean (SD)	Body length (m) (SD)	Wingspan mean (m) (SD)	Flight type: Flapping or Gliding	% of flights upwind
Kittiwake	0.9929 (±0.0003)	13.1 (±0.40)	0.40 (±0.12)	0.39 (±0.005)	1.08 (±0.0625)	Flapping	**50**
Great black-backed gull	0.9940 (±0.0004)	13.7 (±1.20)	0.375 (±0.0637)	0.71 (±0.035)	1.58 (±0.0375)	Flapping	**50**
Herring gull	0.9940 (±0.0004)	12.8 (±1.80)	0.375 (±0.0637)	0.6 (±0.0225)	1.44 (±0.03)	Flapping	**50**
Arctic tern	0.9908 (±0.0004)	10.9 (±0.9)[a]	0.125 (±0)[b]	0.34 (±0.005)[c]	0.8 (±0.025)[c]	Flapping	**50**
Common tern	0.9908 (±0.0004)	10.9 (0.9)[a]	0.125 (±0)[b]	0.33 (±0.01)[c]	0.875 (±0.0525)[c]	Flapping	**50**
Gannet	0.9929[d] (±0.0003)	14.9 (±0)[e]	0.14 (±0.10)	0.94 (±0.0325)	1.72 (±0.0375)	Gliding	**50**

[a] Flight speed from Alerstam et al. (2007), consulted with NatureScot at ETG meeting 3 (ETG 3, 2 October 2024), assuming flight speed of common tern is as measured for Arctic tern.

[b] Nocturnal Activity Factor from Garthe and Hüppop (2004), consulted with NatureScot at ETG meeting 3 (ETG 3, 2 October 2024).

[c] Body length and wingspan from Snow and Perrins (1998), consulted with NatureScot at ETG meeting 3 (ETG 3, 2 October 2024).

[d] Excluding macro-avoidance correction of 70% reduction required for non-breeding season.

[e] Gannet flight speed is incorrectly stated to have an SD of 0 in the JNCC and NatureScot guidance. The original data are from Pennycuick (1997) where the mean is given as 14.9 with an SD of 2, although the data advised by JNCC and NatureScot are for air speed and modelling should use ground speed.

11.11.1.8.1.1 Kittiwake

11.11.1.8.1.1.1 Sensitivity

391. Kittiwake is assessed to have a **medium** sensitivity to collision risk based on available data on the percentage of time spent flying at heights within the rotor swept area of offshore WTGs, flight agility, the percentage of time flying, the extent of nocturnal flight activity and conservation importance (with reference to Garthe and Hüppop, 2004; Furness and Wade, 2012; Furness et al., 2013; Wade et al., 2016).

11.11.1.8.1.1.2 Impact

392. The total annual mean number of kittiwake collisions for the regional population under the WCS is estimated to be 78.9 individuals (**Table 11.50**).

393. The level of impact of collision mortality on the survival rate of the regional population would be 0.039% (**Table 11.51**). This change is above the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

394. With an additional mortality of up to 78.9 individuals the model predicts over 35 years a reduction in growth rate by up to 0.05% (C-PGR = 0.9995) and a reduction in population size by up to 1.63% (C-PS = 0.9837) when using both the national and local Minches and Western Scotland demographic rates (**Table 11.52**).

395. Based on the C-PGR predictions and exemplified by the upper confidence intervals being very close to or above 1.0 (indistinguishable change from baseline), this magnitude of increase in mortality is considered as being of **negligible** magnitude.

11.11.1.8.1.1.3 Significance

396. As the species is of medium sensitivity to collision risk, with a negligible impact magnitude, the effect significance is **negligible**, which is **not significant** in EIA terms.

Table 11.50 Kittiwake seasonal and annual mean collision rate estimates using WCS.

Season	Reference population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the reference population.	WCS total seasonal collision rate (individuals)	WCS collision rates (individuals) used to calculate annual collision rate[1]
Breeding season	204,122	N/A	48.7	48.7
BDMPS Spring migration	691,526	0.30	36.4	10.8
BDMPS Autumn migration	911,586	0.22	86.9	19.5
Annual (Breeding + BDMPS seasons)				78.9

[1]. Annual collision rate for the regional population. Outside of the breeding season this is calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal WCS collision rate.

Table 11.51 Impact on kittiwake survival rate resulting from WCS collision mortality.

CRM Scenario	Estimated annual collision mortality within regional breeding population (all indivs.)	Regional breeding population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
WCS	78.9	204,122	0.039%	Y

Table 11.52 Projected PVA metrics for WCS collision mortality after 25, 35 and 50 years for kittiwake for the WDA-alone.

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS 25	78.9	0.0003867	0.9995	0.9995	0.0003	0.9990	1.0000	0.9881	0.9883	0.0084	0.9719	1.0049
CEH National WCS 35			0.9995	0.9995	0.0002	0.9991	1.0000	0.9836	0.9837	0.0092	0.9660	1.0020
CEH National WCS 50			0.9997	0.9997	0.0002	0.9993	1.0000	0.9835	0.9837	0.0101	0.9642	1.0040
Minches and W Scot WCS 25			0.9995	0.9995	0.0002	0.9991	1.0000	0.9882	0.9883	0.0075	0.9738	1.0037
Minches and W Scot WCS 35			0.9995	0.9995	0.0002	0.9992	0.9999	0.9835	0.9837	0.0080	0.9685	1.0003
Minches and W Scot WCS 50			0.9997	0.9997	0.0001	0.9994	1.0000	0.9835	0.9837	0.0086	0.9670	1.0016

11.11.1.8.1.2 Great black-backed gull

11.11.1.8.1.2.1 Sensitivity

397. Great black-backed gull is assessed to have a **high** sensitivity to collision risk based on available data on the percentage of time spent flying at heights within the rotor swept area of offshore WTGs, flight agility, the percentage of time flying, the extent of nocturnal flight activity and conservation importance (with reference to Garthe and Hüppop, 2004; Furness and Wade, 2012; Furness et al., 2013; Wade et al., 2016).

398. The mean maximum foraging (+1SD) range for great black-backed gull is 73 km (Woodward et al., 2019) which places the WDA outside of the potential foraging range of UK SPA great black-backed gull breeding colonies, but non-SPA populations are likely to contribute to individuals at risk. The total breeding season regional population size is estimated to be 3,273 individuals (**Table 11.11**).

11.11.1.8.1.2.2 Impact

399. The total annual mean number of great black-backed gull collisions for the regional population under the WCS is estimated to be 0.8 individuals (**Table 11.53**).

400. The level of impact of collision mortality on the survival rate of the regional population would be 0.024% (**Table 11.53**). This change is above the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

401. With an additional mortality of up to 0.8 individuals the model predicts over 35 years a reduction in growth rate by up to 0.03% (C-PGR = 0.9997) and a reduction in population size by up to 0.96% (C-PS = 0.9904) when using the local Minches and Western Scotland demographic rates (**Table 11.55**).

402. Based on the C-PGR predictions and exemplified by the upper confidence intervals including 1.0 (indistinguishable change from baseline), this magnitude of increase in mortality is considered as being of **negligible** magnitude.

11.11.1.8.1.2.3 Significance

403. Taking the high sensitivity of great black-backed gulls and the negligible magnitude of impact, the overall effect on great black-backed gull is considered to be **minor adverse** and **not significant** in EIA terms.

Table 11.53 Great black-backed gull seasonal and annual mean collision rate estimates using WCS.

Season	Reference population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the reference population.	WCS total seasonal collision rate (individuals)	WCS collision rates (individuals) used to calculate annual collision rate[1]
Breeding season	3,273	N/A	0.21	0.21
BDMPS non-breeding season	34,380	0.095	6.24	0.59
Annual (Breeding + BDMPS seasons)				0.80

1. Annual collision rate for the regional population. Outside of the breeding season this is calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal WCS collision rate.

Table 11.54 Impact on great black-backed gull survival rate resulting from WCS collision mortality.

CRM Scenario	Estimated annual collision mortality within regional breeding population (all indivs.)	Regional breeding population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
WCS	0.80	3,273	0.024%	Y

Table 11.55 Projected PVA metrics for WCS collision mortality after 25, 35 and 50 years for great black-backed gull for the WDA-alone.

Scenario	Impact	Increase in mortality	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS 25	0.80	0.0002456	0.9997	0.9997	0.0005	0.9988	1.0007	0.9930	0.9932	0.0247	0.9462	1.0419
CEH National WCS 35			0.9997	0.9997	0.0003	0.9991	1.0004	0.9906	0.9906	0.0247	0.9432	1.0395
CEH National WCS 50			0.9998	0.9998	0.0002	0.9994	1.0003	0.9905	0.9906	0.0247	0.9435	1.0397
Minches and W Scot WCA 25			0.9997	0.9997	0.0005	0.9988	1.0007	0.9931	0.9931	0.0255	0.9429	1.0433
Minches and W Scot WCA 35			0.9997	0.9997	0.0004	0.9990	1.0004	0.9901	0.9904	0.0256	0.9403	1.0412
Minches and W Scot WCA 50			0.9998	0.9998	0.0003	0.9993	1.0003	0.9901	0.9904	0.0256	0.9398	1.0412

11.11.1.8.1.3 Arctic tern

11.11.1.8.1.3.1 Sensitivity

404. Arctic terns are assessed to have a **medium** sensitivity to collision risk based on available data on the percentage of time spent flying at heights within the rotor swept area of offshore WTGs, flight agility, the percentage of time flying, the extent of nocturnal flight activity and conservation importance (with reference to Garthe and Hüppop, 2004; Furness and Wade, 2012; Furness et al., 2013; Wade et al., 2016).

405. The mean maximum foraging range (+1SD) for Arctic tern is 40.5 km (**Table 11.10**) which places the WDA beyond potential foraging range of SPA Arctic tern breeding colonies, but non-SPA breeding populations may contribute to individuals at risk. The total breeding season regional population size is estimated to be 2,330 individuals (**Table 11.11**).

11.11.1.8.1.3.2 Impact

406. The total annual mean number of Arctic tern collisions for the regional population under the WCS is estimated to be 0.59 individuals (**Table 11.56**). The level of impact of collision mortality on the survival rate of the regional population would be 0.025% (**Table 11.57**).

407. This change is above the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**).

408. With an additional mortality of up to 0.59 individuals the model predicts over 35 years a reduction in growth rate by up to 0.06% (C-PGR = 0.9994) and no reduction in population size (C-PS = 1.0505) **Table 11.58.**

409. Based on the C-PGR predictions and exemplified by the upper confidence intervals including 1.0 (indistinguishable change from baseline), this magnitude of increase in mortality is considered as being of **negligible** magnitude.

11.11.1.8.1.3.3 Significance

410. Taking the medium sensitivity of Arctic tern and the negligible magnitude of impact, the overall effect on Arctic tern is considered to be **negligible** and **not significant** in EIA terms.

Table 11.56 Arctic tern seasonal and annual mean collision rate estimates using WCS.

Season	Reference population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the reference population.	WCS total seasonal collision rate (individuals)	WCS collision rates (individuals) used to calculate annual collision rate[1]
Breeding season	2330	N/A	0.593	0.593
BDMPS Spring migration	71,398	0.03	0.005	0.0002
BDMPS Autumn migration	71,398	0.03	0.016	0.0005
Annual (Breeding + BDMPS seasons)				0.594

1. Annual collision rate for the regional population. Outside of the breeding season this is calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal WCS collision rate.

Table 11.57 Impact on Arctic tern survival rate resulting from WCS collision mortality.

CRM Scenario	Estimated annual collision mortality within regional breeding population (all indivs.)	Regional breeding population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
WCS	0.59	2,330	0.025%	Y

Table 11.58 Projected PVA metrics for WCS collision mortality after 25, 35 and 50 years for Arctic tern for the WDA-alone.

Scenario	Impact	Increase in mortality	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS 25	0.59	0.0002548	0.9995	0.9995	0.0089	0.9817	1.0171	0.9875	1.0147	0.2463	0.6136	1.5834
CEH National WCS 35			0.9993	0.9994	0.0103	0.9785	1.0203	0.9731	1.0505	0.4371	0.4583	2.0911
CEH National WCS 50			0.9995	0.9919	0.0883	0.9665	1.0279	1.0000	1.2768	1.4473	0.1818	4.0000

11.11.1.8.1.4 Common tern

11.11.1.8.1.4.1 <u>Sensitivity</u>

411. Common tern is assessed to have a **medium** sensitivity to collision risk based on available data on the percentage of time spent flying at heights within the rotor swept area of offshore WTGs, flight agility, the percentage of time flying, the extent of nocturnal flight activity and conservation importance (with reference to Garthe and Hüppop, 2004; Furness and Wade, 2012; Furness et al., 2013; Wade et al., 2016).

412. The mean maximum foraging range (+1SD) for common tern is 26.9 km (**Table 11.10**) which places the WDA beyond potential foraging range of SPA common tern breeding colonies, but small numbers of non-SPA breeding birds may contribute to individuals at risk. The total breeding season regional population size is estimated to be 70 individuals (**Table 11.11**).

11.11.1.8.1.4.2 <u>Impact</u>

413. The total annual mean number of common tern collisions for the regional population under the WCS is estimated to be 0.33 individuals (**Table 11.59**).

414. The level of impact of collision mortality on the survival rate of the small regional adult population would be 0.471% (**Table 11.59**). This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling was conducted.

415. With an additional mortality of 0.33 individuals the model predicts over 35 years a reduction in growth rate by 2.92% (C-PGR = 0.9708, using Minches and West Scotland demographics) but no reduction in population size (C-PS = 1.2318) (**Table 11.61**). This impact is considered to be of **negligible** magnitude.

11.11.1.8.1.4.3 <u>Significance</u>

416. Taking the medium sensitivity of common tern and the negligible magnitude of impact, the overall effect on Arctic tern is considered to be **negligible** and **not significant** in EIA terms.

Table 11.59 Common tern seasonal and annual mean collision rate estimates using WCS.

Season	Reference population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the reference population.	WCS total seasonal collision rate (individuals)	WCS collision rates (individuals) used to calculate annual collision rate[1]
Breeding season	70	N/A	0.328	0.328
BDMPS Spring migration	64,659	0.001	0.026	0.00003
BDMPS Autumn migration	64,659	0.001	0.016	0.00002
Annual (Breeding + BDMPS seasons)				0.33

1. Annual collision rate for the regional population. Outside of the breeding season this is calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal WCS collision rate.

Table 11.60 Impact on common tern survival rate resulting from WCS collision mortality.

CRM Scenario	Estimated annual collision mortality within regional breeding population (all indivs.)	Regional breeding population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
WCS	0.33	70	0.471%	Y

Table 11.61 Projected PVA metrics for WCS collision mortality after 25, 35 and 50 years for common tern for the WDA-alone.

Scenario	Impact	**Increase in mortality rate**	**Counterfactual of Growth Rate**					**Counterfactual of Population Size**				
			Median	**Mean**	**SD**	**LCI**	**UCI**	**Median**	**Mean**	**SD**	**LCI**	**UCI**
CEH National WCS 25	0.33	0.0046864	0.9939	0.9938	0.0233	0.9572	1.0309	0.8498	1.0158	0.7930	0.2647	2.7143
CEH National WCS 35			0.9938	0.9930	0.0326	0.9615	1.0263	0.7963	1.0157	1.0627	0.2000	3.0854
CEH National WCS 50			0.9954	0.9877	0.0890	0.9629	1.0249	0.7825	1.1408	2.0851	0.1255	4.0000
Minches and W Scot WCS 25			0.9937	0.9887	0.0774	0.9380	1.0466	0.8500	1.1725	1.5340	0.1667	4.0650
Minches and W Scot WCS 35			0.9931	0.9708	0.1519	0.9143	1.0428	0.7857	1.2318	1.8651	0.0333	5.3950
Minches and W Scot WCS 50			0.9939	0.9062	0.2859	0.0000	1.0383	0.7308	1.4472	3.1141	0.0000	7.7458

11.11.1.8.1.5 Herring gull

11.11.1.8.1.5.1 Sensitivity

417. Herring gull is assessed to have a **high** sensitivity to collision risk based on available data on the percentage of time spent flying at heights within the rotor swept area of offshore WTGs, flight agility, the percentage of time flying, the extent of nocturnal flight activity and conservation importance (with reference to Garthe and Hüppop, 2004; Furness and Wade, 2012; Furness et al., 2013; Wade et al., 2016).

418. The regional breeding population is estimated as 20,840 individuals (**Table 11.11**). Following recommendations by NatureScot, it has been assumed that all remaining individuals present during the non-breeding season are from the breeding population (i.e. ratio used is 1.0).

11.11.1.8.1.5.2 Impact

419. The total annual mean number of herring gull collisions for the regional population under the WCS is estimated to be 8.0 individuals (**Table 11.62**).

420. The level of impact of collision mortality on the survival rate of the regional adult population would be 0.038% (**Table 11.63**). This change is above the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and so population modelling was conducted (see **Technical Appendix 11.7: PVA**.

421. With an additional mortality of up to 8.0 individuals the model predicts over 35 years a reduction in growth rate by up to 0.05% (C-PGR = 0.9995) and a reduction in population size by up to 1.47% (C-PS = 0.9853) when using the National demographic rates (**Table 11.64**).

422. Based on the C-PGR predictions and exemplified by the upper confidence intervals including 1.0 (indistinguishable change from baseline), this magnitude of increase in mortality is considered as being of **negligible** magnitude.

11.11.1.8.1.5.3 Significance

423. As the species is of high sensitivity to collision risk, with a negligible impact magnitude, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

Table 11.62 Herring gull seasonal and annual mean collision rate estimates using WCS.

Season	Reference population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the reference population.	WCS total seasonal collision rate (individuals)	WCS collision rates (individuals) used to calculate annual collision rate[1]
Breeding season	20,840	N/A	0.34	0.34
BDMPS non-breeding season	20,840	1.00	7.68	7.68
Annual (Breeding + BDMPS seasons)				8.02

1. Annual collision rate for the regional population. Outside of the breeding season this is calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal WCS collision rate.

Table 11.63 Impact on herring gull survival rate resulting from WCS collision mortality.

CRM Scenario	Estimated annual collision mortality within regional breeding population (all indivs.)	Regional breeding population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
WCS	8.02	20,840	0.038%	Y

Table 11.64 Projected PVA metrics for WCS collision mortality after 25, 35 and 50 years for herring gull for the WDA-alone.

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS 25	8.0	0.0003848	0.9995	0.9995	0.0020	0.9957	1.0034	0.9873	0.9894	0.0545	0.8856	1.1050
CEH National WCS 35			0.9995	0.9995	0.0019	0.9956	1.0034	0.9821	0.9853	0.0723	0.8496	1.1335
CEH National WCS 50			0.9997	0.9997	0.0021	0.9955	1.0039	0.9836	0.9886	0.1090	0.7900	1.2199
Minches and W Scot WCA 25			0.9995	0.9995	0.0025	0.9946	1.0047	0.9874	0.9905	0.0692	0.8634	1.1359
Minches and W Scot WCA 35			0.9995	0.9995	0.0027	0.9941	1.0049	0.9814	0.9865	0.0987	0.8039	1.2000
Minches and W Scot WCA 50			0.9996	0.9996	0.0033	0.9929	1.0061	0.9803	0.9933	0.1737	0.6896	1.3710

11.11.1.8.1.6 Gannet

11.11.1.8.1.6.1 Sensitivity

424. Gannet is assessed to have a **medium** sensitivity to collision risk based on available data on the percentage of time spent flying at heights within the rotor swept area of offshore WTGs, flight agility, the percentage of time flying, the extent of nocturnal flight activity and conservation importance (with reference to Garthe and Hüppop, 2004; Furness and Wade, 2012; Furness et al., 2013; Wade et al., 2016).

425. The mean maximum foraging range for gannet (+1SD) is 509.4 km (**Table 11.10**) which places the WDA within the potential foraging range of six UK SPA gannet breeding colonies, although other non-SPA populations are also likely to contribute to individuals at risk. The total breeding season regional population size is estimated to be 566,327 individuals (**Table 11.11**).

426. As the total breeding reference population is larger than the total non-breeding reference populations (both spring and autumn), it has been assumed that all remaining individuals present during the non-breeding season are from the breeding population (i.e. ratio used is 1.0).

11.11.1.8.1.6.2 Impact

427. The total annual mean number of gannet collisions for the regional population under the WCS is estimated to be 14.1 individuals (**Table 11.65**).

428. The level of impact of collision mortality on the survival rate of the regional adult population would be 0.0025% (**Table 11.66**). This change falls below the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and is considered to be of **negligible** magnitude of impact.

11.11.1.8.1.6.3 Significance

429. Taking the medium sensitivity of gannet and the negligible magnitude of impact, the overall effect on gannet is considered to be **negligible** and **not significant** in EIA terms.

Table 11.65 Gannet seasonal and annual mean collision rate estimates using WCS.

Season	Reference population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the reference population.	WCS total seasonal collision rate (individuals)	WCS collision rates (individuals) used to calculate annual collision rate[1]
Breeding season	566,327	N/A	13.42	13.42
BDMPS Spring migration	661,888	0.86	0.55	0.47
BDMPS Autumn migration	545,954	1.00	0.25	0.25
Annual (Breeding + BDMPS seasons)				14.14

1. Annual collision rate for the regional population. Outside of the breeding season this is calculated as the regional breeding season population divided by the BDMPS population then multiplied by the estimated seasonal WCS collision rate.

Table 11.66 Impact on gannet survival rate resulting from WCS collision mortality.

CRM Scenario	Estimated annual collision mortality within regional breeding population (all indivs.)	Regional breeding population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
WCS	14.1	566,327	0.0025%	N

11.11.1.8.2 Migratory IOFs

430. **Annex 11.3D: Migratory Collision Risk Modelling** and **Annex 11.3C: Collision Risk Modelling of Greenland White-Fronted Goose** present the outputs of the mCRM undertaken to estimate potential collision mortality associated with migratory non-seabird species passing through the WDA during the operational phase of the Project. A precautionary assumption was made that all migratory species are of **medium** to **high** sensitivity for collision risk.

431. Species selected for the migratory collision risk assessment were those with a route corridor that included the WDA, as defined by Woodward et al. (2023). Collision risk modelling results for assessed migratory species under the most likely design scenario are presented in Table 6 of **Annex 11.3D: Migratory Collision Risk Modelling**, and results under the worst-case design scenario are presented in Table 7 of **Annex 11.3D: Migratory Collision Risk Modelling**. Results for Greenland white-fronted goose are presented in Table 5 of **Annex 11.3C: Collision Risk Modelling of Greenland White-Fronted Goose**.

432. Predicted annual collision mortality for all migratory species was extremely low in both absolute and proportional terms. The highest mean annual mortality was predicted for mallard (25.6 individuals), yet this represents approximately 0.0031% of the UK population (823,600 individuals). Similarly, relatively higher absolute values for lapwing (5.4 individuals) and golden plover (4.9 individuals) correspond to only ~0.0001% and ~0.0002% of their respective UK populations. The highest proportional impact was predicted for white-tailed eagle (0.0068%), but this still only equates to one collision every 100 years. All other species are below ~0.003% of their UK populations, and therefore PVA modelling was not required. This includes one IOF recorded in non-trivial numbers within the Study Area during baseline surveys - great northern diver – where a collision rate of 0.032 (one every 31 years) was predicted.

433. Overall, therefore, a **negligible** magnitude can be predicted for all migratory species, resulting in **negligible** or **minor adverse** significance of effect, depending upon level of sensitivity of the species to collision risk (**not significant** in EIA terms).

11.11.1.9 Impact 6: Indirect Habitat Loss / Change for Prey Species

11.11.1.9.1 Summary of Potential Impacts

434. Indirect impacts on birds may occur during the O&M stage of the Project if there are impacts on prey species and the habitats of prey species. These indirect effects include those resulting from the production of underwater noise (e.g. the operation of the WTGs), EMF, habitat loss and disturbance; 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.

435. Underwater noise and EMF may cause fish and mobile invertebrates to avoid the operational area and also affect their physiology and behaviour. Habitat loss and disturbance may affect suitable habitats for key prey species (e.g. spawning or burrowing habitat for sandeel) and 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 changes in prey abundance and distribution within the WDA to foraging seabirds. Changes in fish and invertebrate communities due to changes in presence of hard substrate (resulting in colonisation by epifauna) may also occur, and changes in fishing activity could influence the communities present.

436. As already described under Impact 2 for construction, the potential effects on benthic fauna, fish and shellfish have been assessed in EIAR **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish** and the conclusions of those assessments inform this assessment of indirect effects on IOFs.

11.11.1.9.2 Sensitivity

437. As outlined under Impact 2: Indirect disturbance and displacement, the Joint SNCB (2017; updated 2022) guidance provides a list of habitat specialisation scores for seabird species, which can be used as a basis for determining sensitivity to indirect impacts during the O&M phase.

438. The species groups with highest specialisation scores include divers, seaducks and grebes, with seabirds having low or moderate scores. For the IOFs, great northern diver, auks and tern species are considered to have **medium** sensitivity to indirect O&M effects, whereas gulls, petrels, gannet and shearwaters are considered to have **low** sensitivity.

11.11.1.9.3 Impact

439. With regard to permanent habitat loss, **Chapter 8: Benthic Ecology** assesses the nature of any change and impacts on the seabed and benthic habitats, based on the worst-case scenario. The impact of permanent habitat loss does not represent a complete removal of habitat, but rather a physical change from a predominantly sandy / coarse sedimentary habitat to a hard, artificial substratum.

440. The total worst-case area subject to permanent habitat loss due to WDA infrastructure is approximately 1.5% of the total footprint of the WDA. Due to the far-ranging and widespread distribution of benthic ecology receptors, it was concluded that any permanent habitat loss caused by the WDA infrastructure is unlikely to result in adverse effects at the population level. Whilst the impact is long-term, it is highly localised within the WDA. An overall **minor adverse** effect was predicted for all receptors.

441. Subsea hard structures (foundations, scour, and cable protection) are expected to be colonised by a range of epifaunal species and the presence of the structures may also provide habitat for mobile species, for example serving as a refuge for fish. Overall, the area available for colonisation would be low and to date there is no evidence of significant changes of the seabed beyond the vicinity of the foundation structures due to the installation of offshore windfarms. Therefore, the magnitude is considered to be **negligible** in relation to the surrounding habitat available and the highly localised nature of the impact. In addition, the Project is also considering the use of nature inclusive design solutions to promote biodiversity (see **Nature Positive Plan**).

442. There is potential for the Project's subsea electrical cabling to produce EMFs that interfere with the behaviour of benthic species during the operational phase. In general, the occurrence of apparently healthy and diverse communities on existing offshore windfarm structures provides evidence that EMF is unlikely to pose a significant threat to the colonising communities on foundation bases in the longer term. Although EMFs generated by offshore power cables may be detectable by some benthic species, it was concluded through a literature review that any effects are expected to be highly localised due to the rapid attenuation of EMFs with distance, following an inverse square decay pattern.

443. The transfer of electrical current through the Project's subsea electrical cabling also has the potential to generate heat within surrounding sediments (OSPAR Commission, 2009), which could in turn, influence nearby benthic ecological receptors. The footprint of any thermal effect is however expected to be highly limited, typically confined to a narrow zone of less than 1 m surrounding the cable. In addition, where burial is not practicable and cables require external protection, the sheathing and any overlying sediment or cable protection material will act as an insulating barrier. The magnitude of impact is therefore considered to be **negligible**.

444. **Chapter 9 Fish (Including Basking Shark) and Shellfish** assesses the identified O&M impacts on receptors, including those already considered under Impact 2 (construction).

445. Operational noise from the WTGs is predicted to be low intensity and dominated by low-frequency tonal components (<1 kHz). Modelled source levels for operational WTGs (**Appendix 10.1 Underwater Noise Modelling Report**, Table 5.2) are substantially below continuous-noise thresholds for TTS and any effects are expected to be limited to minor, transient behavioural reactions within a few metres of individual WTGs.

446. O&M vessels will contribute short-term, intermittent noise typical of standard marine traffic. Such events will be temporary, localised, and reversible, and will not materially influence the overall operational noise field. The magnitude of impact from underwater noise and vibration is therefore considered to be **negligible**.

447. Regarding permanent habitat loss (1.5% of the WDA), for spawning grounds, the proportion of habitat loss within areas of higher herring spawning potential is negligible, and spawning would continue in adjacent areas unaffected by rock protection. Similarly, the loss of habitat for sandeel is minimal in the context of the extensive suitable substrate available across the **Chapter 9 Fish (Including Basking Shark) and Shellfish** Regional Study Area. Other fish species are generalists and show little sensitivity to localised changes in seabed substrate, meaning any impact would be **negligible**.

448. Nursery grounds for many species may overlap with the WDA; however, the loss of habitat is highly localised and is not expected to affect the functioning of these broader nursery areas. For shellfish, since the permanent habitat loss accounts for approximately 1.5% of the WDA, the level of change would have a highly localised effect and would not be detectable within local or regional crustacean populations.

449. The magnitude of permanent habitat loss for all other receptors is therefore considered to be **negligible**.

450. Changes in fishing activity refer to any alteration in the pattern, intensity or distribution of fishing operations that may occur as a result of the WDA infrastructure (see **Chapter 12 Commercial Fisheries**). The Commercial Fisheries Technical Appendix (**Appendix 12.1**) confirms that the main fisheries operating within and around the WDA comprise inshore potting for brown crab, lobster and velvet crab, together with occasional Nephrops potting.

451. During O&M, fishing activity is expected to resume within and around the WDA, with only intermittent maintenance campaigns introducing small, temporary footprints of exclusion. No permanent safety zones are anticipated under normal operations, although some fishers may voluntarily avoid areas around WTGs or cable corridors due to perceived snagging risk. Spawning and nursery grounds would remain unaffected by operational changes in fishing activity, and diadromous species would continue to migrate through offshore waters without interaction with fisheries. Shellfish species such as crab and lobster, which dominate local fishing effort, are unlikely to experience increased fishing mortality as a result of operational-phase changes, given the ability of fleets to resume activity and the minor scale of any displacement. The magnitude of impact from changes in fishing activity for all receptors is therefore considered to be **negligible**.

452. Overall, impacts on prey species during the O&M phase are considered to be non-significant, and consequently, based on the low numbers of birds present within the WDA that may be affected by indirect impacts, within the context of each species' relevant breeding season reference population, the overall magnitude of impact on IOFs due to the combined indirect impacts during the O&M phase is considered to be **negligible**.

11.11.1.9.4 Significance

453. Taking the low or medium sensitivity of the seabird IOFs and the negligible magnitude of impact, the overall effect for all species is considered to be **negligible** and **not significant** in EIA terms.

11.11.1.10 Impact 7: Artificial Operational Lighting

11.11.1.10.1 Summary of Potential Impacts

454. Artificial lighting impacts during the construction phase were assessed under Impact 3, based on information presented in the **RIAA** which summarises available information, in particular the review by Furness et al. (2026). The scope of the assessment for O&M phase impacts is similar, however the main sources of impact during this phase are as follows:

- Lighting on Project infrastructure within the WDA, particularly WTGs and OSPs; and
- Lighting on vessels associated with O&M activities within and outside of the WDA.

11.11.1.10.2 Sensitivity

455. Artificial lighting impacts during the construction phase were assessed under Impact 3, for Manx shearwater and European storm-petrel (both **high** sensitivity). These two species are again considered as the IOFs during the O&M phase.

11.11.1.10.3 Impact

11.11.1.10.3.1 Lighting on Project Infrastructure

456. Typical lighting requirements for offshore windfarms are described in Furness et al. (2026). Specific details of lighting for the Project are provided in **Appendix 12 Outline Lighting and Marking Plan**.

457. Furness et al. (2026) reports that most offshore windfarm infrastructure lighting is yellow or red, with the brightest lights being the aviation warning lights, at up to 2,000 candela, mounted on the WTG's nacelle, along with the Search and Rescue (SAR) lights at 200 candela. Both the aviation warning lights and SAR lights will be shielded below horizontal so will not be visible to shearwaters and storm-petrels flying low over the sea. Lighting mounted lower on the tower base or transition piece of WTGs is much less bright, e.g. ID lights at 5 candela per square metre. Other marine lights, including lighting on significant peripheral structures, are typically mounted 6-30 metres above HAT. These have a brightness of less than 107 candela at night.

458. The lighting on Project infrastructure during O&M, as presented in **Appendix 12 Outline Lighting and Marking Plan** is very similar to that described in Furness et al. (2026) for a typical offshore windfarm, i.e. lights which are always on are yellow or red and flashing; bright aviation lighting is mounted on the top of the nacelle (at a height of approximately 150 to 175 metres above sea level); navigational lights are of lower intensity and are mounted on WTG towers below the rotor swept area; and marker board lighting colour is unspecified and will be either on the transition piece or low on the WTG's tower, however, the lighting is baffled and of low intensity.

459. Furness et al. (2026) reviewed the extent to which offshore windfarm lighting could attract shearwaters and petrels, given evidence of attraction to other types of artificial lighting (e.g. lighthouses, vessels, urban lighting). In general, it was found that white, violet, blue and green wavelengths of light appear to cause shearwaters and petrels to be dazzled and to be more disorientated than red light; brighter lights cause the dazzle more than dimmer lights; and continuous lights cause the dazzle more than flashing lights.

460. Aviation warning lights are red, flashing lights of 2,000 candelas, shaded below horizontal, and placed as high as possible on peripheral WTGs. As a comparison, these are much less bright than the flashing red light at Bardsey lighthouse (52,277 candelas). Manx shearwaters breed on Bardsey Island, at a distance of 75-350 metres from the lighthouse. Since changing the light from a steady white light to a flashing red light, no Manx shearwaters fledglings have been found grounded by the lighthouse. Prior to changing the light, an average of 53 fledglings per year were found grounded

(Archer et al., 2015). No adult Manx shearwaters were found grounded. This, plus other evidence presented in the review, strongly suggests that red flashing aviation lights would not attract adult nor fledgling Manx shearwaters or European storm petrels. Navigation lights lower down the tower are less bright still, and so less likely to attract shearwaters or storm-petrels than aviation warning lights. These lights are yellow and flashing, which also reduces the probability of seabirds being attracted to them.

461. Furness et al. (2026) concluded that, "*Lower intensity lights are less likely to affect birds. Red lights are less likely to affect birds. Flashing lights are less likely to affect birds. Lights at the top of towers that are shielded so that they do not light below horizontal will not be visible to shearwaters and storm-petrels flying close to sea level. Therefore, it is highly likely that lights on offshore windfarm turbines will have no impact on shearwaters or storm-petrels at UK offshore windfarms*."

462. Evidence suggests that adults shearwaters may avoid ALAN in some cases. This could mean that Manx shearwaters are less likely to fly through the WDA once operational and will avoid the windfarm instead. These barrier effects could increase the cost, in terms of time and energetics, of foraging trips which has the potential to reduce breeding success (Deakin et al., 2022). However, evidence for avoidance of offshore windfarms by Manx shearwaters at night is scarce. This species undertakes very long foraging trips and a deviation around an offshore windfarm is likely to be a trivially small additional energetic cost for a species with extremely energy efficient flight. Furthermore, Manx shearwaters tend to fly more during the day and rest on the sea more at night (Dean et al., 2013). Therefore, any barrier effects created by Manx shearwater avoidance of the WDA at night would be extremely unlikely to result in any reductions in survival or breeding success.

11.11.1.10.3.2 Lighting on Vessels

463. During O&M, fewer vessels would be using the WDA, and would be smaller, in the WDA for short periods, mostly during daylight, and are unlikely to be brightly-lit. Therefore, the risk of attraction of Manx shearwaters and European storm-petrels to vessels within or outside of the WDA is negligible once the Project is operational.

464. Overall, the impacts of O&M lighting on Manx shearwater and European storm-petrel are considered to be of **negligible** magnitude.

11.11.1.10.4 Significance

465. The impacts of artificial lighting during O&M have been determined as negligible for Manx shearwater and European storm-petrel. Although the species are of high sensitivity to artificial lighting, the effect significance is **minor adverse**, which is **not significant** in EIA terms.

11.11.1.11 Impact 8: Combined Operational Displacement and Collision Risk

466. The above Impacts 1-7 have determined the effects on IOFs due to identified impacts in isolation. However, more than one impact pathway may act upon a particular species during a phase of the Project. For two impact pathways during the O&M phase: (i) displacement; and (ii) collision risk, a quantitative assessment was possible, and four species – kittiwake, Arctic tern, common tern and gannet - were identified as having both displacement and collision impacts due to the Project.

467. It is therefore possible that these impacts could combine to adversely affect the relevant populations of these species, and this section provides a quantitative assessment of the combined impacts, based on results presented above for Impact 4 (displacement) and Impact 5 (collision risk).

11.11.1.11.1 Kittiwake

11.11.1.11.1.1 Sensitivity

468. Kittiwake has been assessed to have a **medium** sensitivity to disturbance and displacement (Impact 4) and collision risk (Impact 5).

11.11.1.11.1.2 Impact

469. Under the 'low' displacement mortality scenario (30% displacement and 1% mortality rates) it is predicted that there would be a total annual mortality of 10.6 kittiwake individuals within the regional population due to displacement impacts.

470. Under the 'high' displacement mortality scenario (30% displacement and 3% mortality rates) it is predicted that there would be a total annual mortality of 31.7 individuals within the regional population due to displacement impacts.

471. The total annual mean number of kittiwake collisions for the regional population under the WCS is estimated to be 78.9 individuals.

472. Thus, when displacement and collision risk impacts are combined, the total annual mortality is predicted to be 89.5 (low) to 110.6 (high) individuals (**Table 11.67**).

473. The level of impact of combined displacement and collision mortality on the survival rate of the regional adult population would be up to 0.054%. This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so modelling was conducted (see **Technical Appendix 11.7: PVA**.

474. With an additional combined mortality of up to 110.6 individuals the model predicts over 35 years a reduction in growth rate by up to 0.06% (C-PGR = 0.9994) and a reduction in population size by up to 2.26% (C-PS = 0.9774) using the local Minches and Western Scotland demographic rates (**Table 11.68**).

475. Based on the C-PGR predictions, this increase in mortality is considered to be of **negligible** magnitude.

11.11.1.11.1.3 Significance

476. Taking the medium sensitivity of kittiwake and the negligible magnitude of impact, the overall combined effect is considered to be **negligible** and **not significant** in EIA terms.

Table 11.67 Combined Impact on kittiwake regional population's survival rate resulting from displacement + collision mortality.

Displacement Scenario	Annual displacement mortality (all indivs.)	Annual collision rate WCS (all indivs.)	Estimated combined annual mortality within regional breeding population (all indivs.)	Regional breeding season population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
Displacement (low)	10.6	78.9	89.5	204,122	0.044%	Y
Displacement (high)	31.7		110.6		0.054%	Y

Table 11.68 Projected PVA metrics after 25, 35 and 50 years for kittiwake for the WDA-alone (displacement + collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS CRM + Low 25	89.5	0.0004386	0.9995	0.9995	0.0003	0.9990	1.0000	0.9864	0.9866	0.0083	0.9702	1.0030
CEH National WCS CRM + High 25	110.6	0.0005418	0.9994	0.9994	0.0003	0.9988	0.9999	0.9833	0.9834	0.0085	0.9668	1.0000
CEH National WCS CRM + Low 35	89.5	0.0004386	0.9995	0.9995	0.0002	0.9991	0.9999	0.9813	0.9814	0.0090	0.9638	0.9994
CEH National WCS CRM + High 35	110.6	0.0005418	0.9994	0.9994	0.0002	0.9989	0.9998	0.9771	0.9771	0.0092	0.9587	0.9949
CEH National WCS CRM + Low 50	89.5	0.0004386	0.9996	0.9996	0.0002	0.9993	1.0000	0.9813	0.9815	0.0099	0.9621	1.0011
CEH National WCS CRM + High 50	110.6	0.0005418	0.9995	0.9995	0.0002	0.9992	0.9999	0.9772	0.9772	0.0100	0.9570	0.9967
Regional Minches and W Scot WCS CRM + Low 25	89.5	0.0004386	0.9995	0.9995	0.0002	0.9990	0.9999	0.9867	0.9868	0.0075	0.9724	1.0018
Regional Minches and W Scot WCS CRM + High 25	110.6	0.0005418	0.9994	0.9994	0.0002	0.9989	0.9998	0.9836	0.9837	0.0075	0.9684	0.9987
Regional Minches and W Scot WCS CRM + Low 35	89.5	0.0004386	0.9995	0.9995	0.0002	0.9991	0.9998	0.9815	0.9816	0.0079	0.9663	0.9976
Regional Minches and W Scot WCS CRM + High 35	110.6	0.0005418	0.9994	0.9994	0.0002	0.9990	0.9997	0.9773	0.9774	0.0079	0.9617	0.9932
Regional Minches and W Scot WCS CRM + Low 50	89.5	0.0004386	0.9996	0.9996	0.0001	0.9994	0.9999	0.9816	0.9816	0.0083	0.9655	0.9983
Regional Minches and W Scot WCS CRM + High 50	110.6	0.0005418	0.9995	0.9995	0.0001	0.9993	0.9998	0.9773	0.9774	0.0085	0.9607	0.9946

11.11.1.11.2 Arctic Tern

11.11.1.11.2.1 Sensitivity

477. Arctic tern has been assessed to have a **medium** sensitivity to disturbance and displacement (Impact 4) and collision risk (Impact 5).

11.11.1.11.2.2 Impact

478. Under the ‘low’ displacement mortality scenario (30% displacement and 3% mortality rates) it is predicted that there would be a total annual mortality of 0.8 Arctic tern individuals within the regional population due to displacement impacts.

479. Under the ‘high’ displacement mortality scenario (50% displacement and 3% mortality rates) it is predicted that there would be a total annual mortality of 1.5 individuals within the regional population due to displacement impacts.

480. The total annual mean number of Arctic tern collisions for the regional population under the WCS is estimated to be 0.59 individuals.

481. Thus, when displacement and collision risk impacts are combined, the total annual mortality is predicted to be 1.4 (low) to 2.1 (high) individuals (**Table 11.69**).

482. The level of impact of combined displacement and collision mortality on the survival rate of the regional adult population would be up to 0.09%. This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so modelling was conducted (see **Technical Appendix 11.7: PVA**).

483. With an additional combined mortality of up to 2.1 individuals the model predicts over 35 years a reduction in growth rate by up to 0.11% (C-PGR = 0.9989) and no discernible change in population size (C-PS = 1.0304) (**Table 11.70**).

484. Based on the C-PGR predictions, this increase in mortality is considered to be of **negligible** magnitude.

11.11.1.11.2.3 Significance

485. Taking the medium sensitivity of Arctic tern and the negligible magnitude of impact, the overall combined effect is considered to be **negligible** and **not significant** in EIA terms.

Table 11.69 Combined Impact on Arctic tern's regional population survival rate resulting from displacement + collision mortality.

Displacement Scenario	Annual displacement mortality (all indivs.)	Annual collision rate WCS (all indivs.)	Estimated combined annual mortality within regional breeding population (all indivs.)	Regional breeding season population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
Displacement (low)	0.8	0.59	1.4	2,330	0.060%	Y
Displacement (high)	1.5		2.1		0.090%	Y

Table 11.70 Projected PVA metrics after 25, 35 and 50 years for Arctic tern for the WDA-alone (displacement + collision mortality).

Scenarios	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
HW National WCS CRM + Low 25	1.4	0.0006136	0.9991	0.9991	0.0090	0.9813	1.0169	0.9733	1.0056	0.2525	0.5990	1.5840
HW National WCS CRM + High 25	2.1	0.0008823	0.9987	0.9987	0.0090	0.9806	1.0163	0.9649	0.9952	0.2481	0.5909	1.5671
HW National WCS CRM + Low 35	1.4	0.0006136	0.9992	0.9993	0.0104	0.9789	1.0205	0.9683	1.0451	0.4382	0.4625	2.0835
HW National WCS CRM + High 35	2.1	0.0008823	0.9988	0.9989	0.0103	0.9784	1.0199	0.9556	1.0304	0.4250	0.4490	2.0606
HW National WCS CRM + Low 50	1.4	0.0006136	0.9994	0.9913	0.0905	0.9674	1.0274	0.9630	1.2566	1.4305	0.1802	4.0000
HW National WCS CRM + High 50	2.1	0.0008823	0.9991	0.9923	0.0837	0.9653	1.0273	0.9655	1.2490	1.3028	0.1612	4.0000

11.11.1.11.3 Common Tern

11.11.1.11.3.1 Sensitivity

486. Common tern has been assessed to have a **medium** sensitivity to disturbance and displacement (Impact 4) and collision risk (Impact 5).

11.11.1.11.3.2 Impact

487. Under the ‘low’ displacement mortality scenario (30% displacement and 3% mortality rates) it is predicted that there would be a total annual mortality of 0.6 common tern individuals within the regional population due to displacement impacts.

488. Under the ‘high’ displacement mortality scenario (50% displacement and 3% mortality rates) it is predicted that there would be a total annual mortality of 0.9 individuals within the regional population due to displacement impacts.

489. The total annual mean number of common tern collisions for the regional population under the WCS is estimated to be 0.33 individuals.

490. Thus, when displacement and collision risk impacts are combined, the total annual mortality is predicted to be 0.93 (low) to 1.23 (high) individuals (**Table 11.71**).

491. The level of impact of combined displacement and collision mortality on the survival rate of the regional adult population would be up to 1.76% (**Table 11.72**). This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so modelling was conducted (see **Technical Appendix 11.7: PVA**).

492. With an additional combined mortality of up to 1.2 individuals on the small regional breeding population, the model predicts over 35 years a reduction in growth rate by up to 9.14% (C-PGR = 0.9086 and a reduction in population size by up to 30.1% (C-PS = 0.6985), when using Minches and West Scotland demographics. When using the CEH National demographics, the reduction in growth rate is 3.01% (C-PGR = 0.9699) and the reduction in population size is 42.3% (C-PS = 0.5772). Notably the confidence in these mean values is low since the 95% confidence intervals are wide and include 1 in all cases (i.e. these would not be considered statistically significant results).

493. As outlined in **Section 11.11.1.7.2.4**, under Impact 4 (Displacement), a number of factors should be considered for determining magnitude of impact on the regional common tern breeding population:

- The regional population estimate is very small, at 42 adult individuals. This means that even very small impacts (e.g. less than one individual being lost to the population every year) would materially affect the predicted growth rate and population size over the long-term.
- The small population size also means that the PVA modelling is less robust than when dealing with larger populations and chance effects can have a much greater effect on individual simulations. This can be seen in the confidence intervals, with lower confidence intervals at 0.0, and upper confidence intervals greater than 1.0 for both C-PGR and C-PS **(Table 11.72**), suggesting that the reliability of the results is limited.
- It was also the case that raw counts for the species within the WDA plus 2 km buffer were low, with a total of 27 positively identified individuals observed across all surveys. Arctic tern counts were higher (116 individuals), with a total of 80 ‘commic’ tern observations. It is therefore possible that the ratio used for apportioning commic terns to a species level may be misleading due to the low sample size.
- There appears to be a mis-match between the numbers recorded in the surveys (peak monthly abundance during the breeding season was estimated as being 126 individuals in August 2021 while the breeding season peak mean was 63) and the estimated regional adult breeding

population of 42 individuals. This suggests that either the number of common tern has been over-estimated in the surveys (including assignment of commic terns) or the regional population is larger than thought (i.e. the effects are being over-estimated).

- Therefore, while application of the assessment methodology would indicate a medium or high magnitude of effect, in reality this seems highly improbable given the factors outlined above.

494. Overall, therefore, whilst acknowledging that the regional breeding population is small, and, if following national trends, likely to be subject to threats such as climate change, it is likely that in absolute terms, the number of breeding individuals impacted, and frequency of impact occurrence due to the Project is likely to be very small. The magnitude of increase in mortality on the regional breeding population is therefore considered as being of **low** magnitude.

11.11.1.11.3.3 Significance

495. Taking the medium sensitivity of common tern and the low magnitude of impact, the overall combined effect is considered to be **minor adverse** and therefore **not significant** in EIA terms.

Table 11.71 Combined Impact on common tern's regional population survival rate resulting from displacement + collision mortality.

Displacement Scenario	Annual displacement mortality (all indivs.)	Annual collision rate WCS (all indivs.)	Estimated combined annual mortality within regional breeding population (all indivs.)	Regional breeding season population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
Displacement (low)	0.6	0.33	0.93	70	1.33%	Y
Displacement (high)	0.9		1.23		1.76%	Y

Table 11.72 Projected PVA metrics after 25, 35 and 50 years for common tern for the WDA-alone (displacement + collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS CRM + Low 25	0.9	0.0132671	0.9835	0.9830	0.0245	0.9430	1.0223	0.6504	0.7839	0.6474	0.1856	2.1410
CEH National WCS CRM + High 25	1.2	0.0175574	0.9780	0.9769	0.0315	0.9354	1.0158	0.5579	0.6739	0.5136	0.1419	1.9000
CEH National WCS CRM + Low 35	0.9	0.0132671	0.9834	0.9787	0.0661	0.9419	1.0175	0.5438	0.7064	0.7905	0.1005	2.2262
CEH National WCS CRM + High 35	1.2	0.0175574	0.9778	0.9699	0.0869	0.9339	1.0119	0.4440	0.5772	0.5875	0.0738	1.8333
CEH National WCS CRM + Low 50	0.9	0.0132671	0.9875	0.9707	0.1275	0.9351	1.0186	0.5215	0.8024	1.5175	0.0313	3.0303
CEH National WCS CRM + High 50	1.2	0.0175574	0.9833	0.9564	0.1605	0.0000	1.0146	0.4250	0.6295	0.9234	0.0000	2.4182
Regional Minches and W Scot WCS CRM + Low 25	0.9	0.0132671	0.9841	0.9752	0.0969	0.9202	1.0390	0.6596	0.9082	1.1549	0.0963	3.0000
Regional Minches and W Scot WCS CRM + High 25	1.2	0.0175574	0.9781	0.9600	0.1337	0.8968	1.0295	0.5556	0.7624	0.9053	0.0476	2.6667
Regional Minches and W Scot WCS CRM + Low 35	0.9	0.0132671	0.9823	0.9433	0.1961	0.0000	1.0340	0.5333	0.8782	1.6352	0.0000	4.0000
Regional Minches and W Scot WCS CRM + High 35	1.2	0.0175574	0.9765	0.9086	0.2520	0.0000	1.0263	0.4167	0.6985	1.3037	0.0000	3.0000

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Regional Minches and W Scot WCS CRM + Low 50	0.9	0.0132671	0.9851	0.8424	0.3520	0.0000	1.0309	0.4615	0.9752	2.3308	0.0000	5.0000
Regional Minches and W Scot WCS CRM + High 50	1.2	0.0175574	0.9789	0.7869	0.3954	0.0000	1.0271	0.3333	0.7584	1.8499	0.0000	4.1583

11.11.1.11.4 Gannet

11.11.1.11.4.1 Sensitivity

496. Gannet has been assessed to have a **medium** sensitivity to disturbance and displacement (Impact 4) and collision risk (Impact 5).

11.11.1.11.4.2 Impact

497. Under the 'low' displacement mortality scenario (70% displacement and 1% mortality rates) it is predicted that there would be a total annual mortality of 5.0 gannet individuals within the regional population due to displacement impacts.

498. Under the 'high' displacement mortality scenario (70% displacement and 3% mortality rates) it is predicted that there would be a total annual mortality of 14.6 individuals within the regional population due to displacement impacts.

499. The total annual mean number of gannet collisions for the regional population under the WCS is estimated to be 14.1 individuals.

500. Thus, when displacement and collision risk impacts are combined, the total annual mortality is predicted to be 19.1 (low) to 28.7 (high) individuals (**Table 11.73**).

501. The level of impact of combined displacement and collision mortality on the survival rate of the regional adult population would be up to 0.005%. This change falls below the 0.02% threshold for a PVA, as advised by NatureScot during consultation, and is considered to be of **negligible** magnitude of impact.

11.11.1.11.4.3 Significance

502. Taking the medium sensitivity of gannet and the negligible magnitude of impact, the overall combined effect is considered to be **negligible** and **not significant** in EIA terms.

Table 11.73 Combined Impact on gannet's regional population survival rate resulting from displacement + collision mortality.

Displacement Scenario	Annual displacement mortality (all indivs.)	Annual collision rate WCS (all indivs.)	Estimated combined annual mortality within regional breeding population (all indivs.)	Regional breeding season population (all individuals)	Additional impact on survival rate	PVA required (Y/N)
Displacement (low)	5.0	14.1	19.1	566,327	0.003%	N
Displacement (high)	14.6		28.7		0.005%	N

11.11.1.12 Summary of Significance of Effects for WDA-Alone

503. **Table 11.74** below presents a summary of predicted levels of significance of effects for each impact, and each IOF, as assessed in the previous sections.

Table 11.74 Significance of effect for WDA-alone.

Impact	Important Ornithological Feature	Sensitivity	Magnitude	Significance of Effect	Additional Mitigation	Residual Effect
Construction and Decommissioning						
1. Direct distributional responses and displacement	Great northern diver (WDA and vessel movements)	High	Negligible	Minor adverse	None	Minor adverse
	Seaducks (vessel movements)	Medium or High	Negligible	Negligible or Minor adverse	None	Negligible or Minor adverse
	All other IOFs (WDA and vessel movements)	Medium	Negligible	Negligible	None	Negligible
2. Indirect disturbance and displacement of prey species	Great northern diver, auks and tern species	Medium	Negligible	Negligible	None	Negligible
	All other IOFs	Low	Negligible	Negligible	None	Negligible
3. Artificial construction lighting	Manx shearwater	High	Negligible	Minor adverse	None	Minor adverse
	European storm-petrel	High	Negligible	Minor adverse	None	Minor adverse
	All other IOFs	Low	Negligible	Negligible	None	Negligible
Operation & Maintenance						
4. Direct distributional responses, displacement and barrier effects, vessel movements	Great northern diver	High	Negligible	Minor adverse	None	Minor adverse
	Kittiwake	Medium	Negligible	Negligible	None	Negligible
	Arctic tern	Medium	Negligible	Negligible	None	Negligible
	Common tern	Medium	Low	Minor adverse	None	Minor adverse
	Guillemot	Medium	Low	Minor adverse	None	Minor adverse
	Razorbill	Medium	Low	Minor adverse	None	Minor adverse
	Puffin	Medium	Negligible	Negligible	None	Negligible

Impact	Important Ornithological Feature	Sensitivity	Magnitude	Significance of Effect	Additional Mitigation	Residual Effect
	Fulmar	Medium	Negligible	Negligible	None	Negligible
	Gannet	Medium	Negligible	Negligible	None	Negligible
	All other IOFs	Low	Negligible	Negligible	None	Negligible
5. Collision risk	Kittiwake	Medium	Negligible	Negligible	None	Negligible
	Great black-backed gull	High	Negligible	Minor adverse	None	Minor adverse
	Arctic tern	Medium	Negligible	Negligible	None	Negligible
	Common tern	Medium	Negligible	Negligible	None	Negligible
	Herring gull	High	Negligible	Minor adverse	None	Minor adverse
	Gannet	Medium	Negligible	Negligible	None	Negligible
	Migratory species	Medium or High	Negligible	Negligible	None	Negligible or Minor adverse
	All other IOFs	Low	Negligible	Negligible	None	Negligible
6. Indirect habitat loss / change for prey species	Great northern diver, auks and tern species	Medium	Negligible	Negligible	None	Negligible
	All other IOFs	Low	Negligible	Negligible	None	Negligible
7. Artificial operational lighting	Manx shearwater	High	Negligible	Minor adverse	None	Minor adverse
	European storm-petrel	High	Negligible	Minor adverse	None	Minor adverse
	All other IOFs	Low	Negligible	Negligible	None	Negligible

Impact	Important Ornithological Feature	Sensitivity	Magnitude	Significance of Effect	Additional Mitigation	Residual Effect
Combined Displacement (4) and Collision Risk (5)	Kittiwake	Medium	Negligible	Negligible	None	Negligible
	Arctic tern	Medium	Negligible	Negligible	None	Negligible
	Common tern	Medium	Low	Minor adverse	None	Minor adverse
	Gannet	Medium	Negligible	Negligible	None	Negligible

11.11.2 Combined Assessment: Windfarm Development Area, Offshore Export Cable Corridor and Onshore Transmission Development Area

504. This section presents a qualitative discussion where potential interactions and additive effects between the WDA and the Offshore ECC and OnTDA have been identified, with the aim of determining whether effects could result in those of greater significance than assessed for the WDA-alone assessment. To accompany the description, a combined assessment summary in **Table 11.75** is provided. Only residual effects from the WDA-alone assessment are taken forward for consideration in the combined assessment.

11.11.2.1 Impact 1: Direct Distributional Responses and Displacement

505. Construction-related disturbance was assessed under Impact 1, within the context of construction activities within the WDA, e.g., WTG installation; subsea noise and vibration, e.g. piling, UXO clearance; and vessel movements between ports and the WDA.

506. When taking into account construction activities associated with the Offshore ECC, i.e., cable laying and associated vessel movements, there is a potential for an additive disturbance effect for some species, most likely divers, grebes and seaducks wintering in proximity to the Offshore ECC, albeit different individuals would be affected compared to those that may be found in proximity to vessel routes from ports to the WDA. Any displacement around Offshore ECC construction activities, will more than likely be concentrated at one or two specific locations at any point in time, would be localised, short-term and reversible, and unlikely to be impactful on population survival rates.

507. For breeding seabirds, an increased disturbance-displacement extent is possible due to simultaneous Offshore ECC construction work, which may present more of a risk to specialised coastal feeders with restricted foraging ranges, e.g. terns or guillemot. For other more generalist species such as gulls, or wider ranging species such as gannet or shearwaters, the extent of displacement is unlikely to affect the ability of individuals to forage successfully. Overall, however, the short-term, localised and reversible nature of the impact is unlikely to affect productivity or survival rates at a population level for any species.

508. In relation to the OnTDA, construction disturbance is unlikely to be an additive impact for any IOF considered for the WDA assessment, with the landfall area not overlapping with any seabird breeding sites or foraging habitat, and therefore there is no impact pathway for this aspect of the Project.

509. Consequently, the combined assessment of direct distributional responses and displacement effects on receptors remains **negligible** and **not significant** in EIA terms, consistent with the WDA-alone assessment.

11.11.2.2 Impact 2: Indirect disturbance and displacement of prey species

510. As assessed under Impact 2 for the WDA alone, indirect effects on seabirds due to changes in prey abundance and distribution have the potential of being greater for more specialised species, with restricted habitat choice, diet and foraging range. Construction work associated with the Offshore ECC may temporarily affect the distribution of prey species in proximity to the activities, although this may in turn allow seabirds to access prey which would otherwise have been unavailable due to avoidance of construction vessels.

511. As outlined above under Impact 2, prey species are likely to quickly return to previous distribution after construction has ceased in a particular location, and so any additive indirect impacts due to disturbance or temporary habitat loss are unlikely to be measurable on a seabird population’s survival or productivity rates.

512. In relation to the OnTDA, indirect impacts are unlikely to be additive for any IOF considered for the WDA assessment, with the landfall area not overlapping with any notable seabird foraging habitat, and therefore there is no impact pathway for this aspect of the Project.

513. Consequently, the combined assessment of indirect disturbance and displacement of prey species on receptors remains **negligible** and **not significant** in EIA terms, consistent with the WDA-alone assessment.

11.11.2.3 Impact 3: Artificial Construction Lighting

514. Impacts associated with artificial construction lighting were assessed for Manx shearwater and European storm-petrel, which are nocturnally active. The review of evidence summarised in **Section 11.11.1.6** led to a conclusion that neither species were likely to be materially impacted by artificial lighting associated with construction activities or vessels.

515. The construction activity associated with the Offshore ECC construction would result in an additional source of artificial lighting, although the extent of this is likely to be localised around one or two areas at any point in time, and required lighting intensity for subsea activities is unlikely to be of an intensity that would affect the behaviour of the two species.

516. In relation to the OnTDA, artificial lighting may also be required, should 24-hour construction work be carried out. The level of lighting is however unlikely to be of a magnitude that would be comparable to sources such as lighthouses which have recorded petrel and shearwater groundings, and as such no additive effects are predicted.

517. Consequently, the combined assessment of artificial construction lighting on receptors remains **negligible to minor** and **not significant** in EIA terms, consistent with the WDA-alone assessment.

11.11.2.4 Impacts 4 to 7: Operation & Maintenance Impacts

518. Impacts on IOFs during the O&M phase were assessed under Impacts 4 to 7. Compared to construction phase impacts, there is in general a lower likelihood of combined impacts due to the Offshore ECC or OnTDA.

519. Although displacement of seabirds or prey species around WTGs and other infrastructure within the WDA may occur, there is little chance of this happening in association with the Offshore ECC or OnTDA during the O&M phase, unless during unplanned cable repairs. If this did occur, the extent and duration of displacement is unlikely to materially affect any seabird species population. Similarly, any associated artificial lighting of repair vessels would not affect Manx shearwater or European storm-petrel populations.

520. No impact pathways are identified for collision risks to any species, nor associated with the OnTDA for any impact.

521. Consequently, the combined assessment of O&M impacts on receptors remains **negligible to minor** and **not significant** in EIA terms, consistent with the WDA-alone assessment.

11.11.2.5 Combined Assessment Summary

Table 11.75 Offshore ornithology combined assessment summary

Impact	WDA Residual Effect	Offshore ECC Assessment of Effects	OnTDA Assessment of Effects	Combined Assessment
Construction and Decommissioning				
1. Direct distributional responses and displacement	Not Significant (Negligible or Minor Adverse).	Not Significant (Negligible to Minor Adverse).	N/A – no impact pathway to features.	No significant residual effects likely, due to small extent and duration, and low frequency of impacts associated with the Offshore ECC.
2. Indirect disturbance and displacement of prey species	Not Significant (Negligible Adverse).	Not Significant (Negligible Adverse).	N/A – no impact pathway to features.	No significant residual effects likely, due to small extent and duration, and low frequency of impacts associated with the Offshore ECC.
3. Artificial construction lighting	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	No significant residual effects likely, based on levels of lighting intensity and location and extent of lighting sources.
Operation and Maintenance				
4. Direct distributional responses, displacement and barrier effects	Not Significant (Negligible or Minor Adverse).	Not Significant (Negligible to Minor Adverse).	N/A – no impact pathway to features.	No significant residual effects likely, due to small extent and duration, and low frequency of impacts associated with the Offshore ECC.
5. Collision risk	Not Significant (Negligible or Minor Adverse).	N/A – no impact pathway to features.	N/A – no impact pathway to features.	No additive effects.
6. Indirect habitat loss / change for prey species	Not Significant (Negligible or Minor Adverse).	Not Significant (Negligible to Minor Adverse).	N/A – no impact pathway to features.	No significant residual effects likely, due to small extent and duration, and low frequency of impacts associated with the Offshore ECC.
7. Artificial operational lighting	Not Significant (Negligible or Minor Adverse).	N/A – no impact pathway to features.	N/A – no impact pathway to features.	No additive effects.

11.12 CUMULATIVE EFFECTS

11.12.1 Screening of Potential Cumulative Impacts

522. The first step in the CEA is the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 11.76**, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale.

Table 11.76 Potential cumulative impacts (impact screening)

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Construction			
Impact 1. Direct distributional responses and displacement	No	Low	Only a qualitative assessment is possible for this impact. The distribution of proposed offshore windfarms and their status, indicates that an overlap of construction impacts for the regional breeding population is unlikely.
Impact 2. Indirect disturbance and displacement of prey species	No	Low	Only a qualitative assessment is possible for this impact. The distribution of proposed offshore windfarms and their status, indicates that an overlap of construction impacts for the regional breeding population is unlikely.
Impact 3. Artificial Construction Lighting	No	Low	Only a qualitative assessment is possible for this impact. The distribution of proposed offshore windfarms and their status, indicates that an overlap of construction impacts for the regional breeding population is unlikely.
Operation and Maintenance			
Impact 4. Direct distributional responses, displacement and barrier effects	Yes	Medium	A quantitative approach is possible for this impact, albeit other offshore windfarm data are not available, or not presented in a consistent manner for all IOFs considered here.
Impact 5. Collision risk	Yes	Medium	A quantitative approach is possible for this impact, albeit some other offshore windfarm data are not available, or not presented in a consistent manner for all IOFs considered here. A cumulative assessment is not required for migratory species, due to the very low mortality rates predicted for the WDA-alone.
Impact 6. Indirect habitat loss / change for prey species	No	Low	Only a qualitative assessment is possible for this impact. The distribution of proposed offshore windfarms and their status, indicates that a significant redistribution or change in abundance of prey species for the regional breeding population is unlikely.
Impact 7. Artificial Operational Lighting	No	Low	Only a qualitative assessment would be possible for this impact as information or assessment from other offshore windfarm projects is generally lacking. It was predicted that the WDA-alone would not result in a measurable impact on Manx

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
			shearwater or European storm-petrel populations during O&M.
Impact 8: Combined operational displacement and collision risk	Yes	Medium	Quantitative approach possible and this has been done in tandem with Impacts 4 and 5 for each IOF (where relevant).
Decommissioning			
As per Construction	No	Low	Only a qualitative assessment is possible for these impacts. The distribution of proposed offshore windfarms and their status, indicates that an overlap of decommissioning impacts for the regional breeding population is unlikely.

11.12.2 Screening of Other Plans, Projects and Activities

523. The second screening step in the CEA is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CEA (described as 'project screening'). This information is set out in **Table 11.78**, together with consideration of the relevant details of each, including current status (e.g. under construction), and sources of available data.

524. The project screening has been informed by the development of a CEA Long List (**Appendix 5.1 Cumulative Projects Long and Short List**) which forms an exhaustive list of plans, projects and activities in a very large study area. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out. As described in **Section 11.10.3**, this has been undertaken using a tiered approach to provide a framework for placing relative weight on the potential for each plan or project to be included in the CEA for this topic.

525. With regards to project selection for offshore ornithology features, NatureScot advised that projects within the Western BDMPS (Furness, 2015) should be included in a cumulative assessment (and in-combination assessment under the HRA process):

'we are content with projects in the western BDMPS being taken forward for cumulative assessment but highlight that Welsh, English and Irish sites will still need to be considered' (NatureScot email dated 18 December 2025).

'Cumulative and in-combination project list'…'we would expect projects (wholly or partially) within the Western BDMPS to be included within the in-combination assessment, this should include sites that are within Scottish, Welsh, English, Irish (Northern and Republic) and Manx waters' (NatureScot email dated 22 January 2026).

526. The definition of the Western BDMPS varies slightly between species, but these broadly cover the same region.

11.12.3 Approach to Quantifying Cumulative Impacts

527. For the cumulative assessment, the approach to identifying other projects that are in the species-specific Western BDMPS is presented in detail in **Technical Appendix 11.5: Cumulative and In-combination Mortality**. Projects in the Western BDMPS (note the Western BDMPS regions were extended to include Irish offshore windfarms) included Scottish, English, Welsh, Isle of Man, Northern Ireland and the Republic of Ireland offshore windfarms. Cumulative mortality rates considered for

displacement and/or collision risk impacts are determined separately for the breeding season and the non-breeding season.

528. For the breeding season, offshore windfarms that are (i) in the species' appropriate Western BDMPS (for which quantitative information on collision and displacement impacts to seabirds were available); and (ii) within foraging range of all breeding colonies that formed the regional population, were included in the cumulative assessment.

529. For the non-breeding season, collision and displacement mortalities estimated by offshore windfarms in the species' appropriate Western BDMPS were included in the cumulative assessment. The proportion that a species-specific breeding regional population contributed to the Western BDMPS population was calculated by dividing the breeding regional population by the Western BDMPS population presented in Furness (2015). Non-breeding season mortality recorded at offshore windfarms in the Western BDMPS was then multiplied by the contributing proportion (**Table 11.77**).

Table 11.77 Quantifying non-breeding season cumulative impacts of offshore windfarms within Western BDMPS

Species	Season	Western BDMPS Non-breeding Reference Population (individual adults plus immatures)	Ratio of birds from the regional breeding population compared to the BDMPS non-breeding population
Great northern diver	Non-breeding	2,000	1.00
Arctic tern	Spring	71,398	0.03
	Autumn		0.03
Common tern	Spring	64,659	0.001
	Autumn		0.001
Kittiwake	Spring	691,526	0.30
	Autumn	911,586	0.22
Great black-backed gull	Non-breeding	34,380	0.10
Herring gull	Non-breeding	20,840	1.00
Guillemot	Non-breeding	492,254	1.00
Razorbill	Spring	606,914	0.23
	Autumn		0.23
	Winter	341,422	0.41
Puffin	Non-breeding	304,557	1.00
Fulmar	Spring	828,194	1.00
	Autumn		1.00
	Winter	556,367	1.00
Gannet	Spring	661,888	0.86
	Autumn	545,954	1.00

Table 11.78 Projects within the Western BDMPS

Project / Plan	Jurisdiction	Status	Data Sources for Cumulative Assessment	Description of Project / Plan	Construction Period	Operational Period	Data Confidence	Overlap with the WDA	Included in the CEA	Rationale
Tier 1 projects / plans (projects which are operational (but not part of the baseline), under construction, those with consent and submitted but not yet determined)										
Arklow Bank 2	Republic of Ireland	Consent application submitted	Arklow Bank Wind Park 2 Environmental Impact Assessment Report. Volume II, Chapter 12: Offshore Ornithology and Technical Appendix 12.03 Offshore Ornithology Monthly Seabird Abundance	Offshore Windfarm	2027-2029	2029 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Awel y Mor	Wales	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2026-2030	2031 onward	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Burbo Bank	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2007 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Burbo Bank Extension	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2017 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Codling	Republic of Ireland	Consent application submitted	Codling Wind Park Environmental Impact Assessment Report Volume 4. Appendix 10.04 Offshore Ornithology	Offshore Windfarm	2026-2029	2029 onwards	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA

Project / Plan	Jurisdiction	Status	Data Sources for Cumulative Assessment	Description of Project / Plan	Construction Period	Operational Period	Data Confidence	Overlap with the WDA	Included in the CEA	Rationale
			Displacement and Volume 3. Chapter 10 Ornithology							
Dublin Array	Republic of Ireland	Consent application submitted	Dublin Array EIAR Volume 3: Offshore Infrastructure Assessment Chapters. Chapter 5: Offshore and Intertidal Ecology	Offshore Windfarm	2029-2032	2032 onwards	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Erebus Floating Wind Demo	Wales	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2025-2027	2028 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Gwynt y Mor	Wales	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2015 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Mona	Wales	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2026-2028	2029 onward	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Mooir Vannin	Isle of Man	Consent application submitted	Mooir Vannin Generation Project: Environmental Impact Statement. Volume 2, Chapter 3: Offshore and Intertidal Ornithology	Offshore Windfarm	2031-2033	2033 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Morecambe	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2026-2029	2030 onward	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA

Project / Plan	Jurisdiction	Status	Data Sources for Cumulative Assessment	Description of Project / Plan	Construction Period	Operational Period	Data Confidence	Overlap with the WDA	Included in the CEA	Rationale
Morgan	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2028-2029	2030 onward	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
North Irish Sea Array (NISA)	Republic of Ireland	Consent application submitted	North Irish Sea Array Offshore Wind Farm Environmental Impact Assessment Report. Volume 3: Offshore Chapters. Chapter 15 Offshore Ornithology	Offshore Windfarm	2027-2030	2030 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Oriel	Republic of Ireland	Consent application submitted	Oriel Wind Farm Project Environmental Impact Assessment Report. Chapter 11: Offshore Ornithology	Offshore Windfarm	2028-2030	2030 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Ormonde	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2012 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Rampion	England	Operational	Rampion Offshore Wind Farm ES Section 11 – Marine Ornithology	Offshore Windfarm	2016-2018	2018 onward	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Rampion 2	England	Consented	Rampion 2 Wind Farm Category 6: Environmental Statement. Volume 2, Chapter 12: Offshore and intertidal ornithology	Offshore Windfarm	Uncertain	Uncertain	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA

Project / Plan	Jurisdiction	Status	Data Sources for Cumulative Assessment	Description of Project / Plan	Construction Period	Operational Period	Data Confidence	Overlap with the WDA	Included in the CEA	Rationale
Rhyl Flats	Wales	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2009 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Robin Rigg	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2010 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Twin Hub	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2026	2027 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Walney (1,2)	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2010 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Walney Extension (3,4)	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2018 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
West of Duddon Sands	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	N/A	2010 ongoing	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA
West of Orkney	Scotland	Consented	West of Orkney Windfarm Offshore Ornithology Additional Information	Offshore Windfarm	Uncertain	Uncertain	High	Potential for temporal overlap	Yes	Within same BDMPS as WDA

Project / Plan	Jurisdiction	Status	Data Sources for Cumulative Assessment	Description of Project / Plan	Construction Period	Operational Period	Data Confidence	Overlap with the WDA	Included in the CEA	Rationale
White Cross	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	Offshore Windfarm	2028	2029 onward	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Spiorad na Mara	Scotland	Consent application submitted	Spiorad na Mara Offshore Windfarm: Scoping Report	Offshore Windfarm	Uncertain	Uncertain	Moderate	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Tier 2 projects / plans (all plans/projects assessed under Tier 1, plus those projects with a Scoping Report and/or Scoping Opinion)										
Havbredey	Scotland	Scoping Opinion	Havbredey Offshore Wind Farm: Offshore Scoping Report	Offshore Windfarm	Uncertain	Uncertain	Low	Potential for temporal overlap	Yes	Within same BDMPS as WDA
North Channel Wind 1	Northern Ireland	Scoping Opinion	North Channel Wind 1 and 2 Projects: Offshore EIA Scoping Report	Offshore Windfarm	Uncertain	Uncertain	Low	Potential for temporal overlap	Yes	Within same BDMPS as WDA
North Channel Wind 2	Northern Ireland	Scoping Opinion	North Channel Wind 1 and 2 Projects: Offshore EIA Scoping Report	Offshore Windfarm	Uncertain	Uncertain	Low	Potential for temporal overlap	Yes	Within same BDMPS as WDA
Talisk Offshore Wind Project	Scotland	Scoping Opinion	Talisk Floating Offshore Wind Farm: Offshore Scoping Report	Offshore Windfarm	Uncertain	Uncertain	Low	Potential for temporal overlap	Yes	Within same BDMPS as WDA

Project / Plan	Jurisdiction	Status	Data Sources for Cumulative Assessment	Description of Project / Plan	Construction Period	Operational Period	Data Confidence	Overlap with the WDA	Included in the CEA	Rationale
Tier 3 projects / plans (all plans/projects assessed under Tier 1 and Tier 2, plus those projects likely to come forward where a CES Option to Lease Agreement or equivalent has been granted (i.e., ScotWind and INTOG projects)										
Malin Sea Wind	Scotland	Malin Sea Wind	N/A	Offshore Windfarm	Uncertain	Uncertain	Low	Potential for temporal overlap	Yes	Within same BDMPS as WDA

11.12.4 Cumulative Effects Assessment

530. The following sections present a quantified cumulative assessment of displacement impacts and/or collision risk impacts for all seabird IOFs, utilising data provided in the source material from other offshore windfarms, as outlined in **Table 11.78**. Where an IOF has been determined to be subject to both displacement and collision risk impacts, the predicted mortalities have been summed, and a PVA model has been run for this combined value if required.

531. Following the assessments of displacement and collision risk impacts, a qualitative assessment of cumulative artificial lighting impacts for Manx shearwater and European storm-petrel is presented.

11.12.4.1 Great Northern Diver

11.12.4.1.1 Sensitivity

532. Great northern diver is assessed as having a **high** level of sensitivity to displacement.

533. The species is present during the non-breeding season only, and so the cumulative assessment has taken into consideration any offshore windfarms present within the UK West of Scotland waters BDMPS (see Section 3.1 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details). Only two projects (Robin Rigg and West of Orkney) are within this region, and neither has presented displacement estimates for the species.

11.12.4.1.2 Collision Impact

534. This species was scoped out of collision impacts for the WDA-alone, and so no cumulative assessment has been undertaken.

11.12.4.1.3 Displacement Impact

535. Total annual displacement mortality for great northern diver in the non-breeding season for the WDA-alone was estimated to be less than one bird per annum, for both lower and upper impact scenarios. Although it is possible that birds may be present on occasion within the other two projects within the UK West of Scotland waters BDMPS, numbers appear to be sufficiently low to render any cumulative impact at a population level unlikely. Thus, a **negligible** magnitude of impact is predicted.

11.12.4.1.4 Significance

536. Taking the high sensitivity of great northern diver and the negligible magnitude of cumulative impact, the overall cumulative effect is considered to be **minor adverse** and **not significant** in EIA terms.

11.12.4.2 Kittiwake

11.12.4.2.1 Sensitivity

537. Kittiwake is assessed as having a **medium** level of sensitivity to displacement and collision risks.

538. The recommended breeding season foraging range distance for kittiwake is 300.6 km (**Table 11.10**). Within this distance from the Project, there are 23 other offshore windfarms in the UK Western waters and Channel BDMPS that may contribute to cumulative breeding season mortality within the regional population (see Section 3.4 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details).

11.12.4.2.2 Displacement Impact

539. To determine total cumulative annual displacement mortality, the displacement matrix approach was used on cumulative breeding season abundance values for the Project and the nine developments within foraging range; and for all Scottish developments within the UK Western Waters and Channel BDMPS in the non-breeding (autumn and spring) seasons. For the non-breeding total, the relevant ratios of birds from the regional population compared to the BDMPS non-breeding populations (0.30 in spring and 0.22 in autumn) were applied to determine the total non-breeding season displacement mortality associated with the regional population.

540. The total annual cumulative displacement mortality within the regional population was estimated to be 16 ('low' displacement scenario) to 47 ('high' displacement scenario) individuals.

11.12.4.2.3 Collision Impact

541. To determine total cumulative annual collision mortality, the total cumulative breeding season mortality for the Project and the 23 other offshore windfarms within foraging range was added to the appropriate proportions of total non-breeding season collision mortality associated with all other offshore windfarms within the UK Western Waters and Channel BDMPS. The total annual cumulative collision mortality was estimated to be 525 individuals.

11.12.4.2.4 Combined Displacement and Collision Impact

542. A range of cumulative annual displacement + collision mortality within the regional population was predicted, totalling 541 individuals under the 'low' displacement and WCS CRM scenario, and 572 individuals under the 'high' displacement and WCS CRM scenario (**Table 11.79**).

543. The level of cumulative impact on the survival rate of the regional population would be 0.26% to 0.28%. These changes are above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling is required.

544. The PVA model predicts over 35 years a reduction in population growth rate by 0.33% (C-PGR = 0.9967) and a reduction in population size by up to 11.28% (C-PS = 0.8872) using the Minches and West of Scotland rates (**Table 11.80**).

545. Based on C-PGR predictions, this increase due to cumulative displacement and collision mortality is considered to be of **negligible** magnitude.

11.12.4.2.5 Significance

546. Taking the medium sensitivity of kittiwake to displacement and collision risks, and the negligible magnitude of impact, the overall cumulative effects on kittiwake are considered to be **negligible** and **not significant** in EIA terms.

Table 11.79 Cumulative impact on kittiwake survival rate resulting from displacement and collision mortality.

Scenario[1]	Estimated annual mortality within regional population (all indivs.) [2]	Regional population (all individuals)[3]	Additional impact on survival rate[4]	PVA required (Y/N)[5]
Displacement – Low	15.7	204,122	0.01%	N
Displacement – High	46.8		0.02%	Y
Worst Case Scenario CRM	525.1		0.26%	Y
Low Displacement + WCS CRM	540.8		0.26%	Y
High Displacement + WCS CRM	572.0		0.28%	Y

1. WCS = worst-case collision risk model scenario.
2. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
3. Regional reference populations are summarised in **Table 11.11**.
4. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
5. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.80 Projected cumulative PVA metrics after 25, 35 and 50 years for kittiwake (combined displacement and collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS CRM + Low 25	540.8	0.0026494	0.9969	0.9969	0.0003	0.9963	0.9974	0.9215	0.9214	0.0079	0.9058	0.9370
CEH National WCS CRM + High 25	572.0	0.0028021	0.9967	0.9967	0.0003	0.9961	0.9972	0.9172	0.9172	0.0080	0.9012	0.9333
CEH National WCS CRM + Low 35	540.8	0.0026494	0.9969	0.9969	0.0002	0.9964	0.9973	0.8929	0.8928	0.0085	0.8757	0.9097
CEH National WCS CRM + High 35	572.0	0.0028021	0.9967	0.9967	0.0002	0.9962	0.9971	0.8872	0.8872	0.0085	0.8700	0.9038
CEH National WCS CRM + Low 50	540.8	0.0026494	0.9978	0.9978	0.0002	0.9974	0.9981	0.8929	0.8929	0.0093	0.8743	0.9112
CEH National WCS CRM + High 50	572.0	0.0028021	0.9977	0.9977	0.0002	0.9973	0.9980	0.8871	0.8872	0.0092	0.8690	0.9054
Regional Minches and W Scot WCS CRM + Low 25	540.8	0.0026494	0.9969	0.9969	0.0002	0.9964	0.9973	0.9215	0.9216	0.0072	0.9075	0.9359

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Regional Minches and W Scot WCS CRM + High 25	572.0	0.0028021	0.9967	0.9967	0.0002	0.9962	0.9971	0.9172	0.9172	0.0071	0.9030	0.9314
Regional Minches and W Scot WCS CRM + Low 35	540.8	0.0026494	0.9969	0.9969	0.0002	0.9965	0.9972	0.8930	0.8930	0.0074	0.8783	0.9074
Regional Minches and W Scot WCS CRM + High 35	572.0	0.0028021	0.9967	0.9967	0.0002	0.9963	0.9970	0.8872	0.8872	0.0073	0.8727	0.9018
Regional Minches and W Scot WCS CRM + Low 50	540.8	0.0026494	0.9978	0.9978	0.0001	0.9975	0.9981	0.8930	0.8930	0.0080	0.8770	0.9086
Regional Minches and W Scot WCS CRM + High 50	572.0	0.0028021	0.9977	0.9977	0.0001	0.9974	0.9979	0.8872	0.8872	0.0078	0.8715	0.9026

11.12.4.3 Arctic tern

11.12.4.3.1 Sensitivity

547. Arctic tern is assessed as having a **medium** level of sensitivity to displacement and collision risks.

548. The recommended breeding season foraging range distance for Arctic tern is 40.5 km (**Table 11.10**). Within this distance from the Project, there are no other offshore windfarms in the UK Western Waters BDMPS that may contribute to cumulative breeding season mortality within the regional population (see Section 3.2 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details).

11.12.4.3.2 Displacement Impact

549. To determine total cumulative annual displacement mortality, the displacement matrix approach was used on breeding season abundance values for the Project; and for all developments within the UK Western Waters BDMPS in the non-breeding (autumn and spring) seasons. For the non-breeding total, the relevant ratio of birds from the regional population compared to the BDMPS non-breeding populations (0.03) was applied to determine the total non-breeding season displacement mortality associated with the regional population.

550. Only one other project, West of Orkney, presented estimated displacement mortality rates. Combining these with the Project, the total annual cumulative displacement mortality within the regional population was estimated to be 0.8 ('low' displacement scenario) to 1.5 ('high' displacement scenario) individuals (**Table 11.81**).

11.12.4.3.3 Collision Impact

551. To determine total cumulative annual collision mortality, the total breeding season mortality for the Project was added to the appropriate proportions of total non-breeding season collision mortality associated with all other offshore windfarms within the UK Western Waters BDMPS. Six other projects provided collision mortality estimates, and after applying the relevant ratio, the total annual cumulative collision mortality on the regional population was estimated to be 0.6 individuals.

11.12.4.3.4 Combined Displacement and Collision Impact

552. A range of cumulative annual displacement + collision mortality within the regional population was predicted, totalling 1.5 individuals under the 'low' displacement and WCS CRM scenario, and 2.1 individuals under the 'high' displacement and WCS CRM scenario (**Table 11.81**).

553. These changes are above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling is required. The PVA model predicts over 35 years a reduction in population growth rate by 0.11% (C-PGR = 0.9989) and no discernible reduction in population size (C-PS = 1.0316) (**Table 11.82**).

554. Based on C-PGR predictions, this increase due to cumulative displacement and collision mortality is considered to be of **negligible** magnitude.

11.12.4.3.5 Significance

555. Taking the medium sensitivity of Arctic tern to displacement and collision risks, and the negligible magnitude of impact, the overall cumulative effects on Arctic tern are considered to be **negligible** and **not significant** in EIA terms.

Table 11.81 Cumulative impact on Arctic tern survival rate resulting from displacement and collision mortality.

Scenario[1]	Estimated annual mortality within regional population (all indivs.) [2]	Regional population (all individuals)[3]	Additional impact on survival rate[4]	PVA required (Y/N)[5]
Displacement – Low	0.8	2,330	0.04%	Y
Displacement – High	1.5		0.06%	Y
Worst Case Scenario CRM	0.6		0.03%	Y
Low Displacement + WCS CRM	1.5		0.06%	Y
High Displacement + WCS CRM	2.1		0.09%	Y

1. WCS = worst-case collision risk model scenario.
2. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
3. Regional reference populations are summarised in **Table 11.11**.
4. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
5. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.82 Projected cumulative PVA metrics after 25, 35 and 50 years for Arctic tern (combined displacement and collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
HW National WCS CRM + Low 25	1.5	0.0006345	0.9990	0.9991	0.0089	0.9818	1.0173	0.9786	1.0039	0.2499	0.6028	1.5850
HW National WCS CRM + High 25	2.1	0.0009088	0.9986	0.9986	0.0088	0.9809	1.0163	0.9630	0.9920	0.2428	0.5955	1.5472
HW National WCS CRM + Low 35	1.5	0.0006345	0.9992	0.9990	0.0175	0.9792	1.0195	0.9697	1.0415	0.4467	0.4595	2.0278
HW National WCS CRM + High 35	2.1	0.0009088	0.9987	0.9989	0.0103	0.9785	1.0196	0.9592	1.0316	0.4342	0.4487	2.0417
HW National WCS CRM + Low 50	1.5	0.0006345	0.9995	0.9925	0.0848	0.9691	1.0272	0.9778	1.2562	1.3478	0.2000	4.0000
HW National WCS CRM + High 50	2.1	0.0009088	0.9990	0.9927	0.0812	0.9689	1.0278	0.9487	1.2469	1.3859	0.2000	4.0000

11.12.4.4 Common tern

11.12.4.4.1 Sensitivity

556. Common tern is assessed as having a **medium** level of sensitivity to displacement and collision risks.

557. The recommended breeding season foraging range distance for common tern is 26.9 km (**Table 11.10**). Within this distance from the Project, there are no other offshore windfarms in the UK Western Waters BDMPS that may contribute to cumulative breeding season mortality within the regional population (see Section 3.3 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details).

11.12.4.4.2 Displacement Impact

558. No other project in the UK Western Waters BDMPS presented estimated displacement mortality rates for common tern. The total annual cumulative displacement mortality within the regional population was therefore unchanged from the WDA-alone, with an estimated 0.6 ('low' displacement scenario) to 0.9 ('high' displacement scenario) individuals (**Table 11.83**).

11.12.4.4.3 Collision Impact

559. To determine total cumulative annual collision mortality, the total breeding season mortality for the Project was added to the appropriate proportions of total non-breeding season collision mortality associated with all other offshore windfarms within the UK Western Waters BDMPS. Six other projects provided collision mortality estimates, and after applying the relevant ratio (0.001), the total annual cumulative collision mortality on the regional population was estimated to be 0.3 individuals.

11.12.4.4.4 Combined Displacement and Collision Impact

560. A range of cumulative annual displacement + collision mortality within the regional population was predicted, totalling 0.9 individuals under the 'low' displacement and WCS CRM scenario, and 1.2 individuals under the 'high' displacement and WCS CRM scenario (**Table 11.83**).

561. These changes are above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling is required. The PVA model predicts over 35 years a reduction in population growth rate between 2.9% and 8.3% (C-PGR = 0.9706 to 0.9174, national and regional demographics respectively) and a reduction in population size between 29.3% and 42.3% (C-PS = 0.7064 (regional) to 0.5765 (national); **Table 11.84**).

562. As outlined in **Section 11.11.1.7.2.4**, under Impact 4 (Displacement), a number of factors should be considered for determining magnitude of impact on the regional common tern breeding population:

- The regional population estimate is very small, at 42 adult individuals. This means that even very small impacts (e.g. up to one individual being lost to the population every year) would materially affect the predicted growth rate and population size over the long-term.
- The small population size also means that the PVA modelling is less robust than when dealing with larger populations and chance effects can have a much greater effect on individual simulations. This can be seen in the confidence intervals, with the span from 0.0 to >1.0 for both C-PGR and C-PS (**Table 11.84**), suggesting that the reliability of the results is limited.
- It was also the case that raw counts for the species within the WDA plus 2 km buffer were low, with a total of 27 positively identified individuals observed across all surveys. Arctic tern counts were higher (116 individuals), with a total of 80 'commic' tern observations. It is therefore possible that the ratio used for apportioning commic terns to a species level may be misleading due to the low sample size.

- There appears to be a mis-match between the numbers recorded in the surveys (peak monthly abundance during the breeding season was estimated as being 126 individuals in August 2021 while the breeding season peak mean was 63) and the estimated regional adult breeding population of 42 individuals. This suggests that either the number of common tern has been over-estimated in the surveys (including assignment of commic terns) or the regional population is larger than thought (i.e. the effects are being over-estimated).
- Therefore, while application of the assessment methodology would indicate a medium or high magnitude of effect, in reality this seems highly improbable given the factors outlined above.

563. Overall, therefore, whilst acknowledging that the regional breeding population is small, and, if following national trends, likely to be subject to threats such as climate change, it is likely that in absolute terms, the number of breeding individuals impacted, and frequency of impact occurrence due to the WDA-alone and cumulatively with other offshore windfarms is likely to be very small. The magnitude of increase in mortality on the regional breeding population is therefore considered as being of **low** magnitude.

11.12.4.4.5 Significance

564. Taking the medium sensitivity of common tern to displacement and collision risks, and the low magnitude of impact, the overall cumulative effects on common tern are considered to be **minor adverse** and therefore **not significant** in EIA terms.

Table 11.83 Cumulative impact on common tern survival rate resulting from displacement and collision mortality.

Scenario[1]	Estimated annual mortality within regional population (all indivs.) [2]	Regional population (all individuals)[3]	Additional impact on survival rate[4]	PVA required (Y/N)[5]
Displacement – Low	0.6	70	0.9%	Y
Displacement – High	0.9		1.3%	Y
Worst Case Scenario CRM	0.3		0.4%	Y
Low Displacement + WCS CRM	0.9		1.3%	Y
High Displacement + WCS CRM	1.2		1.7%	Y

1 WCS = worst-case collision risk model scenario.

2 Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.

3 Regional reference populations are summarised in **Table 11.11**.

4 Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.

5 As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.84 Projected cumulative PVA metrics after 25, 35 and 50 years for common tern (combined displacement and collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	U Ci	Median	Mean	SD	LCI	UCI
CEH National WCS CRM + Low 25	0.9	0.0130087	0.9840	0.9829	0.0279	0.9431	1.0210	0.6494	0.7805	0.6259	0.1780	2.1304
CEH National WCS CRM + High 25	1.2	0.0172991	0.9786	0.9774	0.0342	0.9365	1.0160	0.5641	0.6823	0.5788	0.1554	1.8581
CEH National WCS CRM + Low 35	0.9	0.0130087	0.9836	0.9789	0.0662	0.9421	1.0175	0.5499	0.7104	0.7789	0.0974	2.2500
CEH National WCS CRM + High 35	1.2	0.0172991	0.9784	0.9706	0.0848	0.9328	1.0121	0.4528	0.5765	0.6128	0.0735	1.8000
CEH National WCS CRM + Low 50	0.9	0.0130087	0.9879	0.9682	0.1374	0.9340	1.0191	0.5385	0.7959	1.3665	0.0215	3.0699
CEH National WCS CRM + High 50	1.2	0.0172991	0.9837	0.9537	0.1695	0.0000	1.0150	0.4391	0.6376	1.0506	0.0000	2.3963

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	U Ci	Median	Mean	SD	LCI	UCI
Regional Minches and W Scot WCS CRM + Low 25	0.9	0.0130087	0.9840	0.9751	0.0969	0.9172	1.0389	0.6564	0.9012	1.0473	0.0909	3.1429
Regional Minches and W Scot WCS CRM + High 25	1.2	0.0172991	0.9785	0.9649	0.1176	0.9017	1.0330	0.5714	0.7826	1.0018	0.0606	2.6375
Regional Minches and W Scot WCS CRM + Low 35	0.9	0.0130087	0.9825	0.9340	0.2163	0.0000	1.0318	0.5238	0.8503	1.4411	0.0000	3.6533
Regional Minches and W Scot WCS CRM + High 35	1.2	0.0172991	0.9772	0.9174	0.2373	0.0000	1.0280	0.4333	0.7064	1.2601	0.0000	3.0000
Regional Minches and W Scot WCS CRM + Low 50	0.9	0.0130087	0.9852	0.8385	0.3559	0.0000	1.0304	0.4615	0.9618	2.0238	0.0000	5.2500
Regional Minches and W Scot WCS CRM + High 50	1.2	0.0172991	0.9796	0.7969	0.3879	0.0000	1.0271	0.3333	0.7746	1.8116	0.0000	4.1900

11.12.4.5 Great black-backed gull

11.12.4.5.1 Sensitivity

565. Great black-backed gull is assessed as having a **high** level of sensitivity to collision risks.

566. The recommended breeding season foraging range distance for great black-backed gull is 73 km. Within this distance from the Project, there are no other offshore windfarms in the UK West of Scotland Waters BDMPS that may contribute to cumulative breeding season mortality within the regional population (see Section 3.5 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details).

11.12.4.5.2 Displacement Impact

567. This species was scoped out of displacement impacts for the WDA-alone, and so no cumulative assessment has been undertaken.

11.12.4.5.3 Collision Impact

568. To determine total cumulative annual collision mortality, the total breeding season mortality for the Project was added to the appropriate proportions of total non-breeding season collision mortality associated with all other offshore windfarms within the UK West of Scotland BDMPS that have collision rate estimates (Robin Rigg and West of Orkney OFWs). The total annual cumulative collision mortality was estimated to be 2.1 individuals (**Table 11.85**).

569. The level of cumulative impact on the survival rate of the regional population would be 0.06%. This change is above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so population modelling is required.

570. The PVA model predicts over 35 years a reduction in population growth rate by 0.07% (C-PGR = 0.9993) and a reduction in population size by up to 2.48% (C-PS = 0.9752) (**Table 11.86**).

571. Based on C-PGR predictions, this increase due to cumulative collision mortality is considered to be of **negligible** magnitude.

11.12.4.5.4 Significance

572. Taking the high sensitivity of great black-backed gull to collision risks, and the negligible magnitude of impact, the overall cumulative effects on great black-backed gull are considered to be **minor adverse** and **not significant** in EIA terms.

Table 11.85 Cumulative impact on great black-backed gull survival rate resulting from collision mortality.

Scenario	Estimated annual mortality within regional population (all indivs.) [1]	Regional population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Worst Case Scenario CRM	2.1	3,273	0.06%	Y

1. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are summarised in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.86 Projected cumulative PVA metrics after 25, 35 and 50 years for great black-backed gull (collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	U Ci	Median	Mean	SD	LCI	UCI
CEH National WCS CRM 25	2.1	0.0006421	0.9993	0.9993	0.0004	0.9984	1.0002	0.9815	0.9820	0.0242	0.9361	1.0311
CEH National WCS CRM 35			0.9993	0.9993	0.0003	0.9987	0.9999	0.9746	0.9752	0.0242	0.9298	1.0239
CEH National WCS CRM 50			0.9995	0.9995	0.0002	0.9991	1.0000	0.9746	0.9752	0.0242	0.9301	1.0243
Regional Minches and W Scot WCS CRM 25			0.9993	0.9993	0.0005	0.9984	1.0003	0.9821	0.9823	0.0256	0.9325	1.0344
Regional Minches and W Scot WCS CRM 35			0.9993	0.9993	0.0004	0.9986	1.0000	0.9754	0.9755	0.0256	0.9262	1.0271
Regional Minches and W Scot WCS CRM 50			0.9995	0.9995	0.0003	0.9990	1.0000	0.9752	0.9755	0.0256	0.9260	1.0275

11.12.4.6 Herring Gull

573. The recommended breeding season foraging range distance for herring gull is 85.6 km (**Table 11.10**). Within this distance from the Project, there are no other offshore windfarms in the UK West of Scotland Waters BDMPS that may contribute to cumulative breeding season mortality within the regional population (see Section 3.6 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details). NatureScot advises to also apply this distance for screening in developments within a zone of influence during the non-breeding season, rather than the BDMPS approach used for other species. With no offshore windfarms present, this means that there are **no cumulative effects** for this species.

11.12.4.7 Guillemot

574. The recommended breeding season foraging range distance for guillemot is 95.2 km (**Table 11.10**). Within this distance from the Project, there are no other offshore windfarms in the UK Western Waters BDMPS that may contribute to cumulative breeding season mortality within the regional population (see Section 3.7 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details). NatureScot advises to also apply this distance for screening in developments within a zone of influence during the non-breeding season, rather than the BDMPS approach used for other species, as guillemots tend to remain close to their breeding colonies during the non-breeding season. With no offshore windfarms present, this means that there are **no cumulative effects** for this species.

11.12.4.8 Razorbill

11.12.4.8.1 Sensitivity

575. Razorbill is assessed as having a **medium** level of sensitivity to displacement.

576. The recommended breeding season foraging range distance for razorbill is 164 km (**Table 11.10**). Within this distance from the Project, there is one other development (Mooir Vannin) that may contribute to the regional population annual displacement mortality.

11.12.4.8.2 Collision Impact

577. This species was scoped out of collision impacts for the WDA-alone, and so no cumulative assessment has been undertaken.

11.12.4.8.3 Displacement Impact

578. To determine total cumulative annual displacement mortality, the displacement matrix approach was used on cumulative breeding season abundance values for the Project and the one (Mooir Vannin) development within foraging range; and for all UK Western waters BDMPS developments in the non-breeding (autumn, winter and spring) seasons. For the non-breeding total, the relevant ratios of birds from the regional population compared to the BDMPS non-breeding populations (0.41 in winter and 0.23 in spring and autumn) were applied to determine the non-breeding season displacement mortality associated with the regional population.

579. The total annual cumulative displacement mortality within the regional population was estimated to be 147 (low) to 377 (high) individuals.

580. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.11% to 0.27% (**Table 11.87**). These changes are above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so modelling is required.

581. With an additional mortality range of 147 to 377 individuals, the model predicted over 35 years a reduction in population growth rate by 0.31% (C-PGR = 0.9969) and a reduction in population size by 10.47% (C-PS = 0.8953) (**Table 11.88**).

582. Based on C-PGR predictions, this increase due to cumulative displacement mortality is considered to be of **low** magnitude.

11.12.4.8.4 Significance

583. Taking the medium sensitivity of razorbill and the low magnitude of cumulative impact, the overall cumulative effect on razorbill is considered to be **minor adverse** and **not significant** in EIA terms.

Table 11.87 Cumulative impact on razorbill survival rate resulting from displacement mortality.

Scenario	Estimated annual mortality within regional population (all indivs.) [1]	Regional population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Displacement – Low	147.4	140,198	0.11%	Y
Displacement – High	377.0		0.27%	Y

1. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are summarised in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.88 Projected cumulative PVA metrics after 25, 35 and 50 years for razorbill (combined displacement mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	U Ci	Median	Mean	SD	LCI	UCI
CEH National WCS Low 25	147.4	0.0010511	0.9988	0.9988	0.0003	0.9982	0.9995	0.9694	0.9693	0.0099	0.9498	0.9890
CEH National WCS High 25	377.0	0.0026890	0.9969	0.9969	0.0003	0.9963	0.9976	0.9232	0.9233	0.0096	0.9043	0.9425
CEH National WCS Low 35	147.4	0.0010511	0.9988	0.9988	0.0003	0.9982	0.9994	0.9578	0.9578	0.0112	0.9357	0.9797
CEH National WCS High 35	377.0	0.0026890	0.9969	0.9969	0.0003	0.9964	0.9975	0.8956	0.8955	0.0105	0.8750	0.9162
CEH National WCS Low 50	147.4	0.0010511	0.9992	0.9992	0.0003	0.9987	0.9997	0.9579	0.9579	0.0134	0.9314	0.9848
CEH National WCS High 50	377.0	0.0026890	0.9978	0.9978	0.0003	0.9973	0.9983	0.8958	0.8956	0.0126	0.8704	0.9202
Regional Minches and W Scot Low 25	147.4	0.0010511	0.9988	0.9988	0.0003	0.9983	0.9993	0.9696	0.9694	0.0087	0.9522	0.9871
Regional Minches and W Scot High 25	377.0	0.0026890	0.9969	0.9969	0.0003	0.9964	0.9975	0.9233	0.9233	0.0085	0.9066	0.9398
Regional Minches and W Scot Low 35	147.4	0.0010511	0.9988	0.9988	0.0002	0.9983	0.9992	0.9579	0.9578	0.0095	0.9394	0.9775
Regional Minches and W Scot High 35	377.0	0.0026890	0.9969	0.9969	0.0002	0.9964	0.9974	0.8954	0.8953	0.0092	0.8776	0.9134

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	U Ci	Median	Mean	SD	LCI	UCI
Regional Minches and W Scot Low 50	147.4	0.0010511	0.9992	0.9992	0.0002	0.9988	0.9995	0.9578	0.9579	0.0106	0.9373	0.9788
Regional Minches and W Scot High 50	377.0	0.0026890	0.9978	0.9978	0.0002	0.9974	0.9982	0.8954	0.8953	0.0103	0.8752	0.9156

11.12.4.9 Puffin

11.12.4.9.1 Sensitivity

584. Puffin is assessed as having a **medium** level of sensitivity to displacement.

585. The recommended breeding season foraging range distance for puffin is 265.4 km (**Table 11.10**). Within this distance from the Project, there are 22 other developments that may contribute to the regional population annual displacement mortality (see Section 3.9 of **Technical Appendix 11.5: Cumulative and In-Combination Mortality** for full details).

11.12.4.9.2 Collision Impact

586. This species was scoped out of collision impacts for the WDA-alone, and so no cumulative assessment has been undertaken.

11.12.4.9.3 Displacement Impact

587. To determine total cumulative annual displacement mortality, the displacement matrix approach was used on cumulative breeding season abundance values for the Project and the 22 developments within foraging range; and for all 23 UK Western waters BDMPS developments in the non-breeding season. For the non-breeding total, all birds from the regional population were considered to comprise the BDMPS non-breeding population and an effective ratio of 1.00 was applied to determine the non-breeding season displacement mortality associated with the regional population.

588. The total annual cumulative displacement mortality within the regional population was estimated to be 168 (low) to 310 (high) individuals (**Table 11.89**).

589. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.02% to 0.03%. These changes are above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so modelling is required.

590. With an additional mortality range of 168 to 310 individuals, the model predicted over 35 years a reduction in population growth rate by up to 0.04% (C-PGR = 0.9996) and a reduction in population size by up to 1.4% (C-PS = 0.9860) (**Table 11.90**).

591. Based on C-PGR predictions, this increase due to cumulative displacement mortality is considered to be of **negligible** magnitude.

11.12.4.9.4 Significance

592. Taking the medium sensitivity of puffin and the negligible magnitude of cumulative impact, the overall cumulative effect on puffin is considered to be **negligible** and **not significant** in EIA terms.

Table 11.89 Cumulative impact on puffin survival rate resulting from displacement mortality.

Scenario	Estimated annual mortality within regional population (all indivs.) [1]	Regional population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Displacement – Low	167.9	1,075,171	0.02%	Y
Displacement – High	310.1		0.03%	Y

1. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are summarised in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.90 Projected cumulative PVA metrics after 25, 35 and 50 years for puffin (combined displacement mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	U Ci	Median	Mean	SD	LCI	UCI
CEH National Low 25	167.9	0.0001858	0.9998	0.9998	0.0001	0.9995	1.0000	0.9945	0.9945	0.0039	0.9866	1.0020
CEH National High 25	310.1	0.0003432	0.9996	0.9996	0.0001	0.9994	0.9999	0.9899	0.9898	0.0039	0.9819	0.9978
CEH National Low 35	167.9	0.0001858	0.9998	0.9998	0.0001	0.9996	1.0000	0.9925	0.9924	0.0045	0.9834	1.0011
CEH National High 35	310.1	0.0003432	0.9996	0.9996	0.0001	0.9994	0.9998	0.9861	0.9860	0.0045	0.9768	0.9949
CEH National Low 50	167.9	0.0001858	0.9999	0.9999	0.0001	0.9997	1.0000	0.9925	0.9924	0.0054	0.9816	1.0031
CEH National High 50	310.1	0.0003432	0.9997	0.9997	0.0001	0.9995	0.9999	0.9860	0.9860	0.0053	0.9755	0.9964
Regional W Scotland E Ireland rates Low 25	167.9	0.0001858	0.9998	0.9998	0.0001	0.9996	1.0000	0.9946	0.9946	0.0034	0.9877	1.0014
Regional W Scotland E Ireland rates High 25	310.1	0.0003432	0.9996	0.9996	0.0001	0.9994	0.9998	0.9900	0.9900	0.0035	0.9830	0.9969
Regional W Scotland E Ireland rates Low 35	167.9	0.0001858	0.9998	0.9998	0.0001	0.9996	1.0000	0.9926	0.9926	0.0038	0.9849	1.0000
Regional W Scotland E Ireland rates High 35	310.1	0.0003432	0.9996	0.9996	0.0001	0.9994	0.9998	0.9862	0.9861	0.0039	0.9784	0.9938
Regional W Scotland E Ireland rates Low 50	167.9	0.0001858	0.9999	0.9999	0.0001	0.9997	1.0000	0.9926	0.9925	0.0043	0.9839	1.0010
Regional W Scotland E Ireland rates High 50	310.1	0.0003432	0.9997	0.9997	0.0001	0.9996	0.9999	0.9862	0.9862	0.0043	0.9774	0.9949

11.12.4.10 Fulmar

11.12.4.10.1 Sensitivity

593. Fulmar is assessed as having a **medium** level of sensitivity to displacement.

594. The recommended breeding season foraging range distance for fulmar is 1,200.2 km (**Table 11.10**). Within this distance from the Project, there are 25 other developments within the UK Western waters plus Channel BDMPS that may contribute to the regional population annual displacement mortality.

11.12.4.10.2 Collision Impact

595. This species was scoped out of collision impacts for the WDA-alone, and so no cumulative assessment has been undertaken.

11.12.4.10.3 Displacement Impact

596. To determine total cumulative annual displacement mortality, the displacement matrix approach was used on cumulative breeding season and non-breeding seasons abundance values for the Project and the 25 developments within foraging range and UK Western waters plus Channel BDMPS. Only one project, West of Orkney, presented estimated displacement mortality rates.

597. The total annual cumulative displacement mortality within the regional population, when taking into account the Project and West of Orkney, was estimated to be 16.4 (low) to 48.2 (high) individuals.

598. The level of impact of displacement mortality on the survival rate of the regional adult population would range from 0.001% to 0.004% (**Table 11.91**). These changes are below the 0.02% threshold for a PVA advised by NatureScot during consultation, and so no modelling is required.

599. Although it is likely that most, if not all other projects in the UK Western waters plus Channel BDMPS would contribute towards a cumulative displacement impact, the total level of mortality is likely to remain low within the context of the large regional population (over one million individuals). The overall increase due to cumulative displacement mortality is therefore considered to be of **negligible** magnitude.

11.12.4.10.4 Significance

600. Taking the medium sensitivity of fulmar and the negligible magnitude of cumulative impact, the overall cumulative effect on fulmar is considered to be **negligible** and **not significant** in EIA terms.

Table 11.91 Cumulative impact on fulmar survival rate resulting from displacement mortality.

Scenario	Estimated annual mortality within regional population (all indivs.) [1]	Regional population (all individuals)[2]	Additional impact on survival rate[3]	PVA required (Y/N)[4]
Displacement – Low	16.4	1,075,171	0.001%	N
Displacement – High	48.2		0.004%	N

1. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
2. Regional reference populations are summarised in **Table 11.11**.
3. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
4. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

11.12.4.11 Gannet

11.12.4.11.1 Sensitivity

601. Gannet is assessed as having a **medium** level of sensitivity to displacement and collision risks.

602. The recommended breeding season foraging range distance for gannet is 509 km (**Table 11.10**). Within this distance from the Project, there are 23 other developments within the UK Western Waters BDMPS which may contribute to the cumulative mortality within the regional population.

11.12.4.11.2 Displacement Impact

603. To determine total cumulative annual displacement mortality within the regional population, the matrix approach was used on cumulative breeding season abundance values for the Project and the 23 other offshore windfarm developments within foraging range; and again, in the non-breeding (autumn and spring) seasons for all these developments, which are within the UK Western Waters BDMPS. For the autumn, it was assumed that all mortality associated with developments was attributable to the breeding season population, whereas for spring the ratio of birds was considered to be 0.86.

604. The total annual cumulative displacement mortality was estimated to be 77.9 (low) to 233.4 (high) individuals (**Table 11.92**).

11.12.4.11.3 Collision Impact

605. To determine total cumulative annual collision mortality within the regional population, the total cumulative breeding season mortality for the Project and the 23 developments within foraging range was added to the total autumn collision mortality, and 0.86 of spring mortality associated with all these developments within the UK Western Waters BDMPS.

606. The total annual cumulative collision mortality was estimated to be 224.2 individuals.

11.12.4.11.4 Combined Displacement and Collision Impact

607. A range of cumulative annual displacement + collision mortality within the regional population was predicted, totalling 302.2 individuals under the 'low' displacement and WCS CRM scenario, and 457.6 individuals under the 'high' displacement and WCS CRM scenario.

608. The level of impact of combined displacement and collision mortality on the survival rate of the regional population would be 0.05% to 0.08%. These changes are above the 0.02% threshold for a PVA advised by NatureScot during consultation, and so modelling is required.

609. With an additional cumulative mortality of 302.2 individuals (low) to 457.6 individuals (high) the model predicts over 35 years a reduction in growth rate by up to 0.1% (C-PGR = 0.9990) and a reduction in population size by up to 3.4% (C-PS = 0.9661) (**Table 11.93**).

610. Based on C-PGR predictions, this increase due to cumulative displacement and collision mortality is considered to be of **negligible** magnitude.

11.12.4.11.5 Significance

611. Taking the medium sensitivity of gannet to displacement and collision risks, and the negligible magnitude of impact, the overall cumulative effects on gannet are considered to be **negligible** and **not significant** in EIA terms.

Table 11.92 Cumulative impact on gannet survival rate resulting from displacement and collision mortality.

Scenario[1]	Estimated annual mortality within regional population (all indivs.) [2]	Regional population (all individuals)[3]	Additional impact on survival rate[4]	PVA required (Y/N)[5]
Displacement – Low	77.9	566,327	0.01%	N
Displacement – High	233.4		0.04%	Y
Worst Case Scenario CRM	224.2		0.04%	Y
Low Displacement + WCS CRM	302.2		0.05%	Y
High Displacement + WCS CRM	457.6		0.08%	Y

1. WCS = worst-case collision risk model scenario.
2. Mortality for all birds within regional population, including birds of all ages as well as sabbatical birds.
3. Regional reference populations are summarised in **Table 11.11**.
4. Additional impact on adult survival rate is calculated as *annual mortality / regional reference population * 100*.
5. As agreed with NatureScot, a PVA is presented if the impact on adult survival rate is >0.02%. For inclusion in cumulative assessments, the total annual mortality attributable to the WDA-alone must also be >0.2 individuals per annum.

Table 11.93 Projected cumulative PVA metrics after 25, 35 and 50 years for gannet (combined displacement and collision mortality).

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
CEH National WCS CRM + Low 25	302.2	0.0005336	0.9994	0.9994	0.0001	0.9991	0.9996	0.9838	0.9837	0.0042	0.9753	0.9919
CEH National WCS CRM + High 25	457.6	0.0008080	0.9990	0.9990	0.0001	0.9988	0.9993	0.9755	0.9755	0.0041	0.9675	0.9836
CEH National WCS CRM + Low 35	302.2	0.0005336	0.9994	0.9994	0.0001	0.9991	0.9996	0.9775	0.9775	0.0046	0.9681	0.9865
CEH National WCS CRM + High 35	457.6	0.0008080	0.9990	0.9990	0.0001	0.9988	0.9993	0.9661	0.9661	0.0045	0.9572	0.9750
CEH National WCS CRM + Low 50	302.2	0.0005336	0.9996	0.9996	0.0001	0.9994	0.9997	0.9776	0.9775	0.0051	0.9672	0.9875
CEH National WCS CRM + High 50	457.6	0.0008080	0.9993	0.9993	0.0001	0.9991	0.9995	0.9662	0.9662	0.0051	0.9560	0.9759
Regional Irish Sea WCS CRM + Low 25	302.2	0.0005336	0.9994	0.9994	0.0001	0.9991	0.9996	0.9837	0.9837	0.0040	0.9759	0.9914

Scenario	Impact	Increase in mortality rate	Counterfactual of Growth Rate					Counterfactual of Population Size				
			Median	Mean	SD	LCI	UCI	Median	Mean	SD	LCI	UCI
Regional Irish Sea WCS CRM + High 25	457.6	0.0008080	0.9990	0.9990	0.0001	0.9988	0.9993	0.9754	0.9754	0.0040	0.9675	0.9832
Regional Irish Sea WCS CRM + Low 35	302.2	0.0005336	0.9994	0.9994	0.0001	0.9992	0.9996	0.9775	0.9775	0.0043	0.9689	0.9858
Regional Irish Sea WCS CRM + High 35	457.6	0.0008080	0.9990	0.9990	0.0001	0.9988	0.9992	0.9662	0.9661	0.0043	0.9576	0.9745
Regional Irish Sea WCS CRM + Low 50	302.2	0.0005336	0.9996	0.9996	0.0001	0.9994	0.9997	0.9775	0.9775	0.0048	0.9680	0.9867
Regional Irish Sea WCS CRM + High 50	457.6	0.0008080	0.9993	0.9993	0.0001	0.9992	0.9995	0.9662	0.9661	0.0048	0.9566	0.9753

11.12.4.12 Cumulative Decommissioning Impacts

612. As there is limited information on the decommissioning of the Project and around the lifecycle of other developments, it is not possible to provide a meaningful cumulative assessment. However, the decommissioning effects are expected to be less than or equal to the construction stage and as such are not expected to contribute materially to any cumulative impact.

613. A Decommissioning Programme will be developed pre-construction to address the principal decommissioning measures for the Project and will be written in accordance with applicable guidance. The Decommissioning Programme will detail the environmental management, and schedule for decommissioning and will be reviewed and updated throughout the lifetime of the Project to account for changing best practices.

11.13 TRANSBOUNDARY EFFECTS

614. Transboundary effects arise when impacts from a development within one EEZ state's territory affects the environment of another EEA member state(s).

615. With regard to the potential for transboundary cumulative impacts, there is potential for seabird collisions and displacement at offshore windfarms outside UK waters, in particular those in Republic of Ireland waters. This has already been accounted for in the quantitative cumulative effects assessments above, where Republic of Ireland offshore windfarm projects within the species' relevant BDMPS region were included in the assessment.

616. Due to the location of the Project, material connectivity for a regional breeding season reference population, even hypothetically, is unlikely to occur in the breeding season, with offshore windfarms from any other EEA member states. Based on the principles of the BDMPS, and known extents of wintering distributions, this may also be the case in the non-breeding season for most species. For distant migratory species such as terns, petrels and shearwaters, it is possible that there are some interactions with other EEA member state offshore windfarms, however the duration of this interaction, and the likelihood of an adverse effect at a population level is likely to be very low.

617. It should also be noted that the spatial scale and hence relevant seabird regional non-breeding population sizes for a transboundary assessment would be much larger than used for the EIA and cumulative assessment here. Thus, the impacts from the WDA-alone and cumulatively would have a lower impact on survival rates than assessed here. It is therefore reasonable to conclude that the transboundary effects on a wider population of breeding and non-breeding seabirds would be **negligible** and **not significant** in EIA terms.

11.14 INTER-RELATED AND INTERACTING IMPACTS

11.14.1 Inter-Relationships

618. **Table 11.94** below provides a summary of the key inter-relationships between offshore ornithology and other technical chapters and indicates where those issues have been addressed in the relevant chapters.

Table 11.94 Offshore ornithology inter-relationships

Topic and description	Related chapter(s)	Where addressed in this chapter	Rationale
Construction			
Increased Suspended sediment	Chapter 8 Benthic Ecology	Impact 2: Indirect disturbance and	Suspended sediment could be contaminated and could cause disturbance/ damage to fish and benthic

Topic and description	Related chapter(s)	Where addressed in this chapter	Rationale
concentration (SSC) and redeposition	Chapter 9 Fish (Including Basking Shark) and Shellfish	displacement of prey species	species e.g. through smothering. The effects identified in these related chapters are used to assess effects to prey species of seabirds.
Temporary habitat loss / change			The changes in habitat could affect fish, shellfish and benthic ecology. The effects identified in these related chapters are used to assess effects to prey species of seabirds.
Disturbance, injury or death due to increased noise or vibration			Construction activities, in particular piling or UXO clearance may affect the distribution of fish, shellfish or benthic fauna, and if unmitigated, result in injury or death if in close proximity. The effects identified in these related chapters are used to assess effects to prey species of seabirds.
Operation and Maintenance			
Alteration of habitats within WDA due to presence of infrastructure	Chapter 8 Benthic Ecology Chapter 9 Fish (Including Basking Shark) and Shellfish	Impact 6: Indirect habitat loss / change for prey species	The changes in habitat could affect fish, shellfish and benthic ecology, either adversely or positively. The effects identified in these related chapters are used to assess effects to prey species of seabirds.
Impacts on benthic fauna due to EMFs or thermal increase associated with offshore cables	Chapter 8 Benthic Ecology Chapter 9 Fish (Including Basking Shark) and Shellfish		The changes in habitat could affect benthic species. The effects identified in these related chapters are used to assess effects to prey species of seabirds.
Changes to commercial fishing distribution or intensity	Chapter 8 Benthic Ecology Chapter 9 Fish (Including Basking Shark) and Shellfish		The changes could affect fish and shellfish distribution and numbers. The effects identified in these related chapters are used to assess effects to prey species of seabirds.
Decommissioning			
As above for Construction			

11.14.2 Interactions

619. The impacts identified and assessed in this chapter have the potential to interact with each other. Areas of potential interaction between impacts are presented in **Table 11.95** and **Table 11.96** below. The impacts are assessed relative to each development phase (i.e. construction, O&M or decommissioning) to see if (for example) multiple construction impacts affecting the same feature could increase the magnitude of impact upon that receptor.

620. A subsequent lifetime assessment has been undertaken which considers the impact interactions identified and the potential for impacts to effect features relevant to this chapter across all development phases (**Table 11.97**).

Table 11.95 Potential interaction between impacts – construction and decommissioning

Potential Interactions Between Construction Impacts			
	Impact 1. Direct distributional responses and displacement	Impact 2. Indirect disturbance and displacement of prey species	Impact 3. Artificial Construction Lighting
Impact 1. Direct distributional responses and displacement		Yes	Yes
Impact 2. Indirect disturbance and displacement of prey species	Yes		No
Impact 3. Artificial Construction Lighting	Yes	No	

Table 11.96 Potential interactions between impacts – operation and maintenance

Potential Interactions Between Operation and Maintenance Impacts				
	Impact 4. Direct distributional responses, displacement and barrier effects	Impact 5. Collision risk	Impact 6. Indirect habitat loss / change for prey species	Impact 7. Artificial Operational Lighting
Impact 4. Direct distributional responses, displacement and barrier effects		No	Yes	Yes
Impact 5. Collision risk	No		Yes	Yes
Impact 6. Indirect habitat loss / change for prey species	Yes	Yes		No
Impact 7. Artificial Operational Lighting	Yes	Yes	No	

Table 11.97 Potential interactions between impacts – phase and lifetime assessment

Potential Interactions Between Impacts					
Impact	**Construction**	**Operation and Maintenance**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
Displacement, redistribution and barrier effects	Negligible or minor adverse for all IOFs.	Negligible or minor adverse for all IOFs.	Negligible or minor adverse for all IOFs.	**No greater than individually assessed impact for each phase.** The duration of displacement impacts would be increased when considering construction related disturbance activities, and O&M displacement around infrastructure. There would however be no increase in numbers of individuals affected when combining all phases, and would not result in an appreciably greater impact than assessed individually	**No greater than individually assessed impact.** As with the phase assessment, all potential effects are non-significant, with no increase in magnitude of numbers of birds affected.
Collision risk	N/A	Negligible or minor adverse for all IOFs.	N/A	N/A	**No greater than individually assessed impact.**
Indirect effects on prey species	Negligible or minor adverse for all IOFs.	Negligible or minor adverse for all IOFs.	Negligible or minor adverse for all IOFs.	**No greater than individually assessed impact for each phase.** The duration of impacts on prey species and therefore IOFs would be increased when considering construction and O&M together. There would however be no increase in numbers of individuals affected when combining all phases and would not result in an appreciably greater impact than assessed individually. Some impacts on prey species, e.g. redistribution or provision of hard substrates, may be beneficial to seabirds.	**No greater than individually assessed impact.**
Artificial lighting	Negligible or minor adverse for all IOFs.	Negligible or minor adverse for all IOFs.	Negligible or minor adverse for all IOFs.	**No greater than individually assessed impact for each phase.** As concluded from the review of artificial lighting impacts on Manx shearwater and European storm-petrel, it is unlikely that Project-related lighting would impact upon these species' populations at any phase of the Project.	**No greater than individually assessed impact.**

11.15 POTENTIAL MONITORING REQUIREMENTS

621. No monitoring to test the predictions made within the assessment of likely significant effects on offshore ornithology is considered necessary as no significant effects are predicted.

11.16 SUMMARY

622. **Table 11.98** presents a summary of the assessment of potential effects on offshore ornithology during the construction, O&M and decommissioning phases of the Project.

623. The assessment has established that the WDA would result in effects of **negligible or minor adverse significance** which are and **not significant** in EIA terms.

Table 11.98 Summary of potential effects for offshore ornithology

Potential Impact	Features	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined assessment	Cumulative Residual Significance of Effect
Construction and Decommissioning										
1. Direct distributional responses and displacement	Great northern diver (WDA and vessel movements)	M-4; M-11; M-13	High	Negligible	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)	N/A	Not significant	Not significant (Minor adverse)
	Seaducks (vessel movements)	M-4; M-11; M-13	Medium or High	Negligible	Not significant (Negligible or Minor adverse)		Not significant (Negligible or Minor adverse)		Not significant	Not significant (Negligible or Minor adverse)
	All other IOFs (WDA and vessel movements)	M-4; M-11; M-13	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
2. Indirect disturbance and displacement of prey species	Great norther diver, auks and tern species	M-4; M-7; M-11	Medium	Negligible	Not significant (Negligible)	N/A	Not significant (Negligible)	N/A	Not significant	Not significant (Negligible)
	All other IOFs	M-4; M-7; M-11	Low	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
3. Artificial construction lighting	Manx shearwater	M-53	High	Negligible	Not significant	N/A	Not significant	N/A	Not significant	Not significant

Potential Impact	Features	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined assessment	Cumulative Residual Significance of Effect
					(Minor adverse)		(Minor adverse)			(Minor adverse)
	European storm-petrel	M-53	High	Negligible	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)
	All other IOFs	M-53	Low	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
Operation and Maintenance										
4. Direct distributional responses, displacement and barrier effects	Great northern diver	M-4; M-13	High	Negligible	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)	N/A	Not significant	Not significant (Minor adverse)
	Kittiwake	M-4; M-13	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Arctic tern	M-4; M-13	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Common tern	M-4; M-13	Medium	Low	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)
	Guillemot	M-4; M-13	Medium	Low	Not significant		Not significant		Not significant	Not significant

Potential Impact	Features	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined assessment	Cumulative Residual Significance of Effect
					(Minor adverse)		(Minor adverse)			(Minor adverse)
	Razorbill	M-4; M-13	Medium	Low	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)
	Puffin	M-4; M-13	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Fulmar	M-4; M-13	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Gannet	M-4; M-13	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	All other IOFs	M-4; M-13	Low	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
5. Collision risk	Kittiwake	M-13; M-30	Medium	Negligible	Not significant (Negligible)	N/A	Not significant (Negligible)	N/A	Not significant	Not significant (Negligible)
	Great black-backed gull	M-13; M-30	High	Negligible	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)

Potential Impact	Features	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined assessment	Cumulative Residual Significance of Effect
	Arctic tern	M-13; M-30	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Common tern	M-13; M-30	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Herring gull	M-13; M-30	High	Negligible	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)
	Gannet	M-13; M-30	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Migratory species	M-13; M-30	Medium or High	Negligible	Not significant (Negligible)		Not significant (Negligible or Minor adverse)		Not significant	Not significant (Negligible or Minor adverse)
	All other IOFs	M-13; M-30	Low	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant (	Not significant (Negligible)
6. Indirect habitat loss / change for prey species	Great norther diver, auks and tern species	M-4; M-7	Medium	Negligible	Not significant (Negligible)	N/A	Not significant (Negligible)	N/A	Not significant	Not significant (Negligible)

Potential Impact	Features	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined assessment	Cumulative Residual Significance of Effect
	All other IOFs	M-4; M-7	Low	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
7. Artificial operational lighting	Manx shearwater	M-53	High	Negligible	Not significant (Minor adverse)	N/A	Not significant (Minor adverse)	N/A	Not significant	Not significant (Minor adverse)
	European storm-petrel	M-53	High	Negligible	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)
	All other IOFs	M-53	Low	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
Combined Displacement (4) and Collision Risk (5)	Kittiwake	M-4; M-13; M-30	Medium	Negligible	Not significant (Negligible)	N/A	Not significant (Negligible)	N/A	Not significant	Not significant (Negligible)
	Arctic tern	M-4; M-13; M-30	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)
	Common tern	M-4; M-13; M-30	Medium	Low	Not significant (Minor adverse)		Not significant (Minor adverse)		Not significant	Not significant (Minor adverse)
	Gannet	M-4; M-13; M-30	Medium	Negligible	Not significant (Negligible)		Not significant (Negligible)		Not significant	Not significant (Negligible)

REFERENCES

Alerstam, T., Rosén, M., Bäckman, J., Ericson, P.G.P. and Hellgren, O. (2007). Flight speeds among bird species: allometric and phylogenetic effects. PLoS Biology, 5, e197.

Archer, M., Hope Jones, P. and Stansfield, S.D. (2015). Departure of Manx shearwaters *Puffinus puffinus* fledglings from Bardsey, Gwynedd, Wales, 1998 to 2013. Seabird 28: 43-47.

Banyard, A.C., Lean, F.Z.X., Robinson, C., Howie, F., Tyler, G., Nisbet, C., Seekings, J., Mirisr, S., Whittard, E., Ashpitel, H.F., Bas, M., Byrne, A.M.P., Lewis, T., James, J., Stephan, L., Lewis, N.S., Brown, I.H., Hansen, R.D.E. and Reid, S.M. (2022). Detection of highly pathogenic avian influenza virus H5N1 clade 2.3. 4.4 b in great skuas: A species of conservation concern in Great Britain. Viruses 14: 212.

Bicknell, A.W.J., Oro, D., Camphuysen, K. and Votier, S.C. (2013). Potential consequences of discard reform for seabird communities. *Journal of Applied Ecology*, 50, 649–658.

Birdlife International. (2026). Seabird Tracking Database. Data available: <https://www.seabirdtracking.org/>. [Accessed 08 April 2026].

Bolton, M. (2021). GPS tracking reveals highly consistent use of restricted foraging areas by European Storm-petrels Hydrobates pelagicus breeding at the largest UK colony: implications for conservation management. *Bird Conservation International*, 31, 35–52.

Bolton, M., Derren, F., Tremlett, C., Wischnewski, S., Franklin, K., Cleasby, I. and Gauld, J. (2025). Tracking of Leach's storm-petrel from St Kilda and European storm-petrel from Treshnish Isles: Final report. Tagging and tracking of seabirds on the west coast of Scotland CORR/5536. Available at: < https://doi.org/10.1080/00063657.2024.2438641>. [Accessed 26 March 2026].

Bradbury, G., Trinder, M., Furness, B., Banks, A.N, Caldow, R.W.G. and Hume, D. (2014). Mapping Seabird Sensitivity to Offshore Wind Farms. PLoS ONE. 9(9): e106366.

Bradbury, G., Trinder, M., Furness, B., Banks, A.N., Caldow, R.W. and Hume, D. (2017) Correction: Mapping seabird sensitivity to offshore wind farms. PloS One, 12, p.e0170863.

British Trust Ornithology. (2026). Data available at: <https://app.bto.org/seabirds/public/data.jsp> [Accessed 08 April 2026].

Brooke, M. de L., Bonnaud, E., Dilley, B.J., Flint, E.N., Holmes, N.D., Jones, H.P., Provost, P., Rocamora, G., Ryan, P.G. and Surman, C. (2018). Seabird population changes following mammal eradications on islands. *Animal Conservation*, 21, 3–12.

Buckingham, L., Bogdanova, M., Green, J., Dunn, R., Wanless, S., Bennett, S., Bevan, R., Call, A., Canham, M., Corse, C.J., Harris, M., Heward, C., Jardine, D., Lennon, J., Parnaby, D., Redfern, C., Scott, L., Swann, R.L., Ward, R. and Daunt, F. (2021). Interspecific variation in non-breeding aggregation: a multi-colony tracking study of two sympatric seabirds. *Marine Ecology Progress Series*. 684. 10.3354/meps13960.

Burnell, D., Perkins, A.J., Newton, S.F., Bolton, M., Tierney, T.D. and Dunn, T.E. (2023). Seabirds Count: A Census of Breeding Seabirds in Britain and Ireland (2015–2021). Lynx Edicions.

Burthe, S.J., Wanless, S., Newell, M.A., Butler, A. and Daunt, F. (2014). Assessing the vulnerability of the marine bird community in the western North Sea to climate change and other anthropogenic impacts. *Marine Ecology Progress Series*, 507, 277–295.

Calladine, J. and Harris, M.P. (1997). Intermittent breeding in the Herring Gull *Larus argentatus* and the Lesser Black-backed Gull *Larus fuscus*. Ibis, 139: 259-263. Available at: <https://doi.org/10.1111/j.1474-919X.1997.tb04623.x>. [Accessed 08 April 2026].

Caneco, B. (2022). R scripts can be used via an online shiny app available at: sCRM (shinyapps.io).

Carroll, M.J., Bolton, M., Owen, E., Anderson, G.Q.A., Mackley, E.K., Dunn, E.K. and Furness, R.W. (2017). Kittiwake breeding success in the southern North Sea correlates with prior sandeel fishing mortality. *Aquatic Conservation*: Marine and Freshwater Ecosystems, 27, 1164–1175.

Carroll, M.J., Butler, A., Owen, E., Ewing, S.R., Cole, T., Green, J.A., Soanes, L.M., Arnould, J.P.Y., Newton, S.F. and Baer, J. (2015). Effects of sea temperature and stratification changes on seabird breeding success. *Climate Research*, 66, 75–89.

CIEEM. (2022). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester (2018, version 1.2 updated 2022).

Cleasby, I.R., Owen, E., Wilson, L. and Bolton, M. (2018). Combining habitat modelling and hotspot analysis to reveal the location of high-density seabird areas across the UK: Technical report. RSPB Research Report.

Cleasby, I.R., Owen, E., Wilson, L., Wakefield, E.D., O'Connell, P. and Bolton, M. (2020). Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping. c, Volume 241. Available at: <https://doi.org/10.1016/j.biocon.2019.108375>. [Accessed 08 April 2026].

Cook, A. (2014). The avoidance rates of collision between birds and offshore turbines. BTO Research Report No 656 to Marine Scotland Science. BTO, Thetford.

Cramp, S., Bourne, W.R.P. and Saunders, D. (1974). The Seabirds of Britain and Ireland. Collins, London.

Critchley, E.J., Grecian, W.J., Bennison, A., Kane, A., Wischnewski, S., Cañadas, A., Tierney, D., Quinn, J.L. and Jessopp, M.J. (2019). Assessing the effectiveness of foraging radius models for seabird distributions using biotelemetry and survey data. *Ecography*, 43: 184-196. Available at: <https://doi.org/10.1111/ecog.04653>. [Accessed 24 March 2026].

Deakin, Z., Cook, A., Daunt, F., McCluskie, A., Morley, N., Witcutt, E., Wright, L. and Bolton, M. (2022). A review to inform the assessment of the risk of collision and displacement in petrels and shearwaters from offshore wind developments in Scotland. Scottish Government.

Deakin, Z., Thomas, R.J., Medeiros, R. and Bolton, M. (2026). Marine distribution and foraging behaviour of European Storm-petrels *Hydrobates pelagicus* in relation to predation risk, competition and oceanography. *Marine Ecology Press*. Available at: <https://doi.org/10.3354/meps15123>. [Accessed 24 March 2026].

Dean, B., Freeman, R., Kirk, H., Leonard, K., Phillips, R.A., Perrins, C.M. and Guilford, T. (2013). Behavioural mapping of a pelagic seabird: combining multiple sensors and a hidden Markov model reveals the distribution of at-sea behaviour. *Journal of the Royal Society Interface*, 10, 20120570. Available at: <https://doi.org/10.1098/rsif.2012.0570>. [Accessed 24 March 2026].

Dias, M.P., Martin, R., Pearmain, E.J., Burfield, I.J., Small, C., Phillips, R.A., Yates, O., Lascelles, B., Borboroglu, P. G. and Croxall, J. P. (2019). Threats to seabirds: a global assessment. *Biological Conservation*, 237, 525–537.

Dulvy, N. K., Rogers, S.I., Jennings, S., Stelzenmüller, V., Dye, S.R. and Skjoldal, H.R. (2008). Climate change and deepening of the North Sea fish assemblage: a biotic indicator of warming seas. *Journal of Applied Ecology*, 45, 1029-1039.

Dunn, R.E., Duckworth, J., O'Brien, S., Furness, R.W., Buckingham, L., Daunt, F., Bogdanova, M. and Green, J.A. (2024). Temporal and spatial variability in availability bias has consequences for marine bird abundance estimates during the non-breeding season. *Ecological Solutions and Evidence*: 5(4). Available at: <https://besjournals.onlinelibrary.wiley.com/doi/full/10.1002/2688-8319.12373>. [Accessed 08 April 2026].

Foster, S., Swann, R.L. and Furness, R.W. (2017). Can changes in fishery landings explain long-term population trends in gulls? Bird Study, 64, 90–97.

Frederiksen, M., Anker-Nilssen, T., Beaugrand, G. and Wanless, S. (2013). Climate, copepods and seabirds in the boreal Northeast Atlantic–current state and future outlook. *Global Change Biology*, 19, 364–372.

Frederiksen, M., Daunt, F., Harris, M.P. and Wanless, S. (2008). The demographic impact of extreme events: stochastic weather drives survival and population dynamics in a long-lived seabird. Journal of Animal Ecology, 77(5), 1020–1029.

Frederiksen, M., Furness, R.W. and Wanless, S. (2007). Regional variation in the role of bottom-up and top-down processes in controlling sandeel abundance in the North Sea. *Marine Ecology Progress Series*, 337, 279–286.

Frederiksen, M., Wanless, S., Harris, M.P., Rothery, P. and Wilson, L.J. (2004). The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. *Journal of Applied Ecology*, 41, 1129–1139.

Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Reports, 164.

Furness, R.W. (2016). Impacts and effects of ocean warming on seabirds. In: Laffoley D, Baxter JM (eds) Explaining ocean warming: Causes, scale, effects and consequences. Full report. IUCN, Gland, Switzerland, pp 271–288.

Furness, R.W. and Tasker, M.L. (2000). Seabird-fishery interactions: quantifying the sensitivity of seabirds to reductions in sandeel abundance, and identification of key areas for sensitive seabirds in the North Sea. *Marine Ecology Progress Series*, 202, 253–264.

Furness, R.W. and Wade, H.M. (2012). Vulnerability of Scottish seabirds to offshore wind turbines. Report to Marine Scotland.

Furness, R.W., Foster, A. and O'Brien, S.H. (2026). Evaluation of seabird attraction to lighting on offshore wind farms. Report by SLR Consulting Ltd and Anatec Ltd to SPR, ESB, NorthLand Power and OceanWinds.

Furness, R.W., Wade, H.M. and Masden, E.A. (2013). Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of Environmental Management*, 119, 56–66.

Garthe, S. and Hüppop, O. (2004). Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. *Journal of Applied Ecology*, 41, 724–734.

Garthe, S., Ludynia, K., Hüppop, O., Kubetzki, U., Meraz, J.F. and Furness, R.W. (2012). Energy budgets reveal equal benefits of varied migration strategies in northern gannets. *Marine Biology*, 159, 1907–1915.

Goodship, N.M. and Furness, R.W. (MacArthur Green) (2022). Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283.

Griffin, L.R., Burrell, E.M., Harrison, A.L., Mitchell, C. and Hilton, G.M. (2020). Conservation management of Greenland white-fronted geese *Anser albifrons flavirostris* on Islay, Scotland. Scottish Natural Heritage Research Report No. 912.

Harris, M.P. (1989). Variation in the correction factor used for converting counts of individual Guillemots *Uria aalge* into breeding pairs. Available at: < https://doi.org/10.1111/j.1474-919X.1989.tb02747.x>. [Accessed 08 April 2026].

Hiddink, J.G., Burrows, M.T. and Molinos, J.G (2015). Temperature tracking by North Sea benthic invertebrates in response to climate change. *Global Change Biology*, 21, 117–129.

Howells, R.J., Burthe, S.J., Green, J.A., Harris, M.P., Newell, M.A., Butler, A., Wanless, S. and Daunt, F. (2018). Pronounced long-term trends in year-round diet composition of the European shag *Phalacrocorax aristotelis*. *Marine Biology*, 165, 188.

Jackson, D. (2018). Scapa Flow proposed Special Protection Area (pSPA) – inshore wintering waterfowl survey 2017/18. Scottish Natural Heritage Research Report No. 1075.

Jarrett, D., Cook, A., Woodward, I., Ross, K., Horswill, C., Dadam, D. and Humphreys, E.M. (2018). Short-term behavioural responses of wintering waterbirds to marine activity. *Scottish Marine and Freshwater Science*, 9(7).

JNCC. (2016). Seabird Population Trends and Causes of Change: 1986-2015 Report. Joint Nature Conservation Committee, Peterborough. Available at: <http://Jncc.Defra.Gov.Uk/Page-3201>. [Accessed 08 April 2026].

Johnston, D.T., Humphreys, E.M., Davies, J.G. and Pearce-Higgins, J.W. (2021). Review of climate change mechanisms affecting seabirds within the INTERREG VA area. Report to Agri-Food and Biosciences Institute and Marine Scotland Science as part of the Marine Protected Area Management and Monitoring (MarPAMM) project.

Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S., Wilson, L.J. and Reid, J.B. (2010). An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs, JNCC Report No. 431. JNCC, Peterborough, ISSN 0963-8091.

Kubetzki, U., Garthe, S., Fifield, D., Mendel, B. and Furness, R. W. (2009). Individual migratory schedules and wintering areas of northern gannets. *Marine Ecology Progress Series*, 391, 257–265.

Lane, J.V., Jeglinski, J.W.E., Avery-Gomm, S., Ballstaedt, E., Banyard, A.C., Barychka, T., Brown, I.H., Brugger, B., Burt, T.V., Careen, N., Castenschiold, J.H.F., Christensen-Dalsgaard, S., Clifford, S., Collins, S.M., Cunningham, E., Danielsen, J., Daunt, F., D'entremont, K.J.N., Doiron, P., Duffy, S., English, M.D., Falchieri, M., Giacinti, J., Gjerset, B., Granstad, S., Grémillet, D., Guillemette, M., Hallgrímsson, G.T., Hamer, K.C., Hammer, S., Harrison, K., Hart, J.D., Hatsell, C., Humpidge, R., James, J., Jenkinson, A., Jessopp, M., Jones, M.E.B., Lair, S., Lewis, T., Malinowska, A.A., McCluskie, A., McPhail, G., Moe, B., Montevecchi, W.A., Morgan, G., Nichol, C., Nisbet, C., Olsen, B., Provencher, J., Provost, P., Purdie, A., Rail, J.-F., Robertson, G., Seyer, Y., Sheddan, M., Soos, C., Stephens, N., Strøm, H., Svansson, V., Tierney, T.D., Tyler, G., Wade, T., Wanless, S., Ward, C.R.E., Wilhelm, S.I., Wischnewski, S., Wright, L.J., Zonfrillo, B., Matthiopoulos, J. and Votier, S.C. (2024). High pathogenicity avian influenza (H5N1) in Northern Gannets (*Morus bassanus*): Global spread, clinical signs and demographic consequences. Ibis. Available at: <https://doi.org/10.1111/ibi.13275>. [Accessed 08 April 2026].

Lewis, M., Wilson, L.J., Söhle, I., Dean, B.J., Webb, A. and Reid, J.B. (2008). Wintering sea ducks, divers and grebes in UK inshore areas: Aerial surveys and shore-based counts 2006/07. JNCC Report, No. 414.

Lewis, S., Burton, E., Butcher, J., Cleasby, I., King, A., Marriott, E., O'Hara, D., Sheddan, M., Watson, M., Wischnewski, S., Wright, L., Wanless, S. and Lane, J.V. (2026), Effect of a previous high pathogenicity avian influenza (HPAIV) infection on the breeding success of Northern Gannets (*Morus bassanus*). Ibis, 168: 361-368.

Lindegren, M., Van Deurs, M., MacKenzie, B.R., Worsoe Clausen, L., Christensen, A. and Rindorf, A. (2018). Productivity and recovery of forage fish under climate change and fishing: North Sea sandeel as a case study. *Fisheries Oceanography*, 27, 212–221.

Lloyd, C., Tasker, M.L. and Partridge, K. (1991). The status of seabirds in Britain and Ireland. London, T. and A.D. Poyser.

Mackenzie, M.L., Scott-Hayward, L.A., Oedekoven, C.S., Skov, H., Humphreys, E. and Rexstad, E. (2013). Statistical modelling of seabird and cetacean data: guidance document. Report SB9 (CR/2012/05), Centre for Research into Ecological and Environmental Modelling, University of St Andrews, St Andrews.

McSorley C.A., Dean B.J., Webb A. and Reid, J.B. (2003). Seabird use of waters adjacent to colonies: Implications for seaward extensions to Existing breeding seabird colony Special Protection Areas. JNCC Report, No. 329.

McSorley, C.A., Wilson, L.J., Dunn, T.E., Gray, C., Dean, B.J., Webb, A. and Reid, J.B. (2008). Manx shearwater *Puffinus puffinus* evening rafting behaviour around colonies on Skomer, Rum and Bardsey: its spatial extent and implications for recommending seaward boundary extensions to existing colony Special Protection Areas in the UK. JNCC Report No. 406.

Mendel, B., Sonntag, N., Wahl, J., Schwemmer, P., Dries, H., Guse, N., Müller, S. and Garthe, S. (2008). Profiles of seabirds and waterbirds of the German North and Baltic Seas: Distribution, ecology and sensitivities to human activities within the marine environment. Bundesamt für Naturschutz, Bonn - Bad Godesberg.

Mitchell, P.I., Newton, S.F., Ratcliffe, N. and Dunn, T.E. (2004). Seabird populations of Britain and Ireland. T. and A.D. Poyser, London.

Moffat, C., Baxter, J., Berx, B., Bosley, K., Boulcott, P., Cox, M., Cruickshank, L., Gillham, K., Haynes, V. and Roberts, A. (2020). Scotland's marine assessment 2020. Scottish Government.

Murray, S., Harris, M.P. and Wanless, S. (2015). The status of the gannet in Scotland in 2013-14. Scottish Birds, 35, 3–18.

Natural England. (2022). Natural England's response to avian influenza in wild birds – August 2022. Available at: <https://naturalengland.blog.gov.uk/2022/08/04/natural-englands-response-to-avian-influenza-in-wild-birds-august-2022>. [Accessed 08 April 2026].

NatureScot. (2023a). Guidance Note 1: Guidance to support Offshore Wind Applications: Marine Ornithology – Overview. Available at: < https://www.nature.scot/doc/guidance-note-1-guidance-support-offshore-wind-applications-marine-ornithology-overview>. [Accessed 08 April 2026].

NatureScot. (2023b). Guidance Note 2: Guidance Note 2: Guidance to support Offshore Wind Applications: Advice for Marine Ornithology Baseline Characterisation Surveys and Reporting. Available at: < https://www.nature.scot/doc/guidance-note-2-guidance-support-offshore-wind-applications-advice-marine-ornithology-baseline>. [Accessed 08 April 2026].

NatureScot. (2023c). Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds - Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges. Available at: < https://www.nature.scot/doc/guidance-note-3-guidance-support-offshore-wind-applications-marine-birds-identifying-theoretical>. [Accessed 08 April 2026].

NatureScot. (2023d). Guidance Note 4: Guidance to Support Offshore Wind Applications: Ornithology - Determining Connectivity of Marine Birds with Marine Special Protection Areas and Breeding Seabirds from Colony SPAs in the Non-Breeding Season. Available at: <https://www.nature.scot/doc/guidance-note-4-guidance-support-offshore-wind-applications-ornithology-determining-connectivity>. [Accessed 08 April 2026].

NatureScot. (2023e). Guidance Note 5: Guidance to support Offshore Wind Applications: Recommendations for marine bird population estimates. Available at: <https://www.nature.scot/doc/guidance-note-5-guidance-support-offshore-wind-applications-recommendations-marine-bird-population>. [Accessed 08 April 2026].

NatureScot. (2023f). Guidance Note 6: Guidance to support Offshore Wind Applications - Marine Ornithology Impact Pathways for Offshore Wind Developments. Available at: https://www.nature.scot/doc/guidance-note-6-guidance-support-offshore-wind-applications-marine-ornithology-impact-pathways>. [Accessed 08 April 2026].

NatureScot. (2023g). Guidance Note 7: Guidance to support Offshore Wind Applications: Marine Ornithology - Advice for assessing collision risk of marine birds. Available at: <https://www.nature.scot/doc/guidance-note-7-guidance-support-offshore-wind-applications-marine-ornithology-advice-assessing>. [Accessed 08 April 2026].

NatureScot. (2023h). Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds. Available at: <https://www.nature.scot/doc/guidance-note-8-guidance-support-offshore-wind-applications-marine-ornithology-advice-assessing>. [Accessed 08 April 2026].

NatureScot. (2023i). Guidance Note 11: Guidance to support Offshore Wind Applications: Marine Ornithology - Recommendations for Seabird Population Viability Analysis (PVA). Available at: <https://www.nature.scot/doc/guidance-note-11-guidance-support-offshore-wind-applications-marine-ornithology-recommendations>. [Accessed 08 April 2026].

NatureScot. (2023j). NatureScot Scientific Advisory Committee Sub-Group on Avian Influenza Report on the H5N1 outbreak in wild birds 2020-2023. Available at: <https://www.nature.scot/doc/naturescot-scientific-advisory-committee-sub-group-avian-influenza-report-h5n1-outbreak-wild-birds>. [Accessed 08 April 2026].

Owen, E. and Morgan, E. (2026). Manx shearwater tracking work on Lunga in 2025. Report for MachairWind Ltd by National Trust for Scotland.

Pearce-Higgins, J.W. (2021). Climate change and the UK's birds. In British Trust for Ornithology Report, Thetford.

Pearce-Higgins, J.W., Humphreys, E.M., Burton, N.H.K., Atkinson, P.W., Pollock, C., Clewley, G.D., Johnston, D.T., O'Hanlon, N.J., Balmer, D.E., Frost, T.M., Harris, S.J. and Baker, H. (2023). Highly pathogenic avian influenza in wild birds in the United Kingdom in 2022: impacts, planning for future outbreaks, and conservation and research priorities. Report on virtual workshops held in November 2022. BTO Research Report 752, BTO, Thetford, UK. Available at: <https://www.bto.org/sites/default/files/publications/rr752_pearce-higgins_et_al_2023_hpai_workshop_final_web_0.pdf>. [Accessed 08 April 2026].

Pennycuick, C. (1997). Actual and "optimum" flight speeds: field data reassessed. *The Journal of Experimental Biology*, 200, 2355–2361.

Perkins, A., Ratcliffe, N., Suddaby, D., Ribbands, B., Smith, C., Ellis, P., Meek, E. and Bolton, M., (2018). Combined bottom-up and top-down pressures drive catastrophic population declines of Arctic skuas in Scotland. *Journal of Animal Ecology* 87, 1573–1586.

Ponchon, A., Provost, P., Bernard, A., Boulinier, T., Lejeune, M., Lescroël, A., Tornos, J. and Grémillet, D. (2026). No impact of black-eye symptom on foraging behaviour and reproductive success of Northern gannets following highly pathogenic avian influenza, *Biological Conservation*, Volume 313,2026, 111546.

Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S., Carlson, T.J., Coombs, S., Ellison, W.T., Gentry, R.L., Halvorsen, M.B. and Løkkeborg, S., (2014[SB214.1]). ASA S3/SC1. 4 TR-2014 Sound exposure guidelines for fishes and sea turtles: A technical report prepared by ANSI-Accredited standards committee S3/SC1 and registered with ANSI. Springer

ProcBe. (2026). The ProcBe Project. JNCC. Available: <https://jncc.gov.uk/our-work/procbe/>. [Accessed 08 April 2026].

Ratcliffe, N. (2004). Causes of seabird population change. Pp 407-437 In Mitchell, P.I., Newton, S.F., Ratcliffe, N. And Dunn, T.E. (Eds.) Seabird Populations of Britain and Ireland. T. and A.D. Poyser, London.

Ratcliffe, N., Mitchell, I.A.N., Varnham, K., Verboven, N. and Higson, P. (2009). How to prioritize rat management for the benefit of petrels: a case study of the UK, Channel Islands and Isle of Man. Ibis, 151, 699–708.

Rhoades, J., Feather, A., Harwood, A., Banks, A. and Boersch-Supan, P.H. (2025). Evaluating aerial LiDAR and other approaches to avian flight height measurement – ReSCUE Project Validation Study Report. BTO Research Report 796.

Rock, P. and Vaughan, I. (2013). Long-term estimates of adult survival rates of urban Herring Gulls *Larus argentatus* and Lesser Black-backed Gulls *Larus fuscus*. Ringing and Migration. 28. 21-29. Available at: <https://doi.org/10.1080/03078698.2013.811179>. [Accessed 08 April 2026].

Rogerson, K., Sinclair, R., Tyler, G., St John Glew, K., Seeney, A, Coppack, T. and Jervis, L. (2021). Development of Marine Bird Sensitivity Assessments for FeAST. NatureScot Research Report 1273. Ruddock, M. and Whitfield, D.P. (2007). A review of disturbance distances in selected bird species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

RPS. (2014). 2009-2011, RPS, Argyll Array, Bird Survey. The Crown Estate Scotland. Data available: <https://www.marinedataexchange.co.uk/details/CES-29/2009-2011-rps-argyll-array-bird-survey>. [Accessed 08 April 2026].

Sandvik, H., Erikstad, K.E. and Sæther, B.E. (2012). Climate affects seabird population dynamics both via reproduction and adult survival. *Marine Ecology Progress Series*, 454, 273–284.

Schwemmer, P. Mendel, B., Sonntag, N., Dierschke, V. and Garthe, S. (2011) Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. *Ecological Applications*, 21, 1851-1860.

Scottish Government. (2025). Offshore wind energy - draft updated Sectoral Marine Plan 2025: consultation. Available at: <https://www.gov.scot/publications/draft-updated-sectoral-marine-plan-offshore-wind-energy-2025/pages/5/>. [Accessed 09 April 2026].

Scottish Government. (2026). Offshore wind policy statement 2020 update: Scotland's Offshore Wind Ambition. Available at: <https://www.gov.scot/publications/update-2020-offshore-wind-policy-statement-scotlands-offshore-wind-ambition-2/>. [Accessed 09 April 2026].

Scottish Natural Heritage. (2016). Sound of Gigha Proposed Special Protection Area (pSPA) NO. UK9020318. SPA Site Selection Document: Summary of the scientific case for site selection. Report to Marine Scotland.

Searle, K. R., Regan, C. E., Perrow, M. R., Butler, A., Rindorf, A., Harris, M. P., Newell, M. A., Wanless, S. and Daunt, F. (2023). Effects of a fishery closure and prey abundance on seabird diet and breeding success:

Implications for strategic fisheries management and seabird conservation. *Biological Conservation* 281. Available at: <https://doi.org/10.1016/j.biocon.2023.109990>. [Accessed 08 April 2026].

Searle, K., Mobbs, D., Daunt, F. and Butler, A. (2019). A Population Viability Analysis Modelling Tool for Seabird Species. Centre for Ecology and Hydrology report for Natural England. Natural England Commissioned Report NECR274.

SNCB. (2022a). Joint SNCB Interim Displacement Advice Note. January 2017 (updated January 2022). Available at: <https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/joint-sncb-interim-displacement-…[Accessed 08 April 2026].

SNCB. (2022b). Joint SNCB Interim Advice on the treatment of displacement for Red-throated Diver. Available at: <https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/interim-sncb-advice-rtd-displace… [Accessed 08 April 2026].

SNCB. (2024). Joint advice note from the Statutory Nature Conservation Bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments. Available at <https://jncc.gov.uk/resources/f7892820-0f84-4e96-9eff-168f93bd343d>. [Accessed 08 April 2026].

Snow, D.W. and Perrins, C.M. (eds) (1998). The Birds of the Western Palearctic, Concise edition. London Oxford University Press.

Söhle, I., O'Brien, S.H., Dean, B.J., Wilson, L.J., Webb, A. and Reid, J.B. (2009). The numbers of inshore waterbirds using the waters of Mull, Coll and Tiree during the non-breeding season; an assessment of the area's potential for qualification as a marine SPA. JNCC Report No. 416.

Söhle, I., Wilson, L.J., Dean, B.J., O'Brien, S.H., Webb, A. and Reid, J.B. (2006). Wintering sea ducks, divers and grebes in UK inshore areas: Aerial surveys and shore-based counts 2005/06. JNCC Report, No. 392.

Spencer, S M. (2012). Diving Behavior and Identification of Sex of Breeding Atlantic Puffins (*Fratercula arctica*), and Nest-Site Characteristics of Alcids on Petit Manan Island, Maine. University of Massachusetts Amherst.

Stone, C.J., Webb, A. and Tasker, M.L. (1995). The distribution of Manx shearwaters *Puffinus puffinus* in north-west European waters. Bird Study 41:170-180. Available at: <https://doi.org/10.1080/00063659409477217>. [Accessed 24 March 2026].

Sydeman, W.J., Thompson, S.A., Anker-Nilssen, T., Arimitsu, M., Bennison, A., Bertrand, S., Boersch-Supan, P., Boyd, C., Bransome, N. C. and Crawford, R.J.M. (2017). Best practices for assessing forage fish fisheries-seabird resource competition. *Fisheries Research*, 194, 209–221.

Tasker, M.L., Camphuysen, C.J., Cooper, J., Garthe, S., Montevecchi, W. A. and Blaber, S.J.M. (2000). The impacts of fishing on marine birds. *ICES Journal of Marine Science*, 57, 531–547.

Thaxter C.B., Daunt, F., Grémillet, D., Harris M. P., Benvenuti, S., Watanuki, Y., Hamer, K.C. Wanless, W. (2013) Modelling the Effects of Prey Size and Distribution on Prey Capture Rates of Two Sympatric Marine Predators. PLoS ONE 8(11): e79915. Available at: <https://doi.org/10.1371/journal.pone.0079915>. [Accessed 24 March 2026].

The Crown Estate. (2026). Offshore Wind Evidence and Change Programme ProcBe Annual Report No. 2. Year 2. Strategic shearwater and storm petrel demography, distribution, and at-sea behaviour to improve understanding of impacts of offshore wind farms on SPA populations in UK waters. The Crown Estate, London.

Tremlett, C.J., Morley, N. and Wilson, L.J. (2024). UK seabird colony counts in 2023 following the 2021-22 outbreak of Highly Pathogenic Avian Influenza. RSPB Research Report 76. RSPB Centre for Conservation Science, RSPB, The Lodge, Sandy, Bedfordshire, SG19 2DL.

Trinder M., O'Brien S.H. and Deimel J. (2024) 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.

Upton, A., Williams, S.J. and Williams, E.J. (2018). North Orkney proposed Special Protection Area (pSPA) - Inshore wintering waterfowl survey 2017/18 (Research Report 1074). Scottish Natural Heritage.

Votier, S.C., Bicknell, A., Cox, S.L., Scales, K.L. and Patrick, S.C. (2013). A bird's eye view of discard reforms: bird-borne cameras reveal seabird/fishery interactions. PLoS One, 8, e57376.

Votier, S.C., Birkhead, T.R., Oro, D., Trinder, M., Grantham, M.J., Clark, J. A., McCleery, R. H. and Hatchwell, B.J. (2008). Recruitment and survival of immature seabirds in relation to oil spills and climate variability. *Journal of Animal Ecology*, 77, 974-983.

Votier, S.C., Furness, R.W., Bearhop, S., Crane, J.E., Caldow, R.W.G., Catry, P., Ensor, K., Hamer, K.C., Hudson, A.V. and Kalmbach, E. (2004). Changes in fisheries discard rates and seabird communities. *Nature*, 427, 727–730.

Wade, H.M., Masden, E.A., Jackson, A.C. and Furness, R.W. (2016). Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. *Marine Policy*, 70, 108–113.

Waggitt, J., Andrade, J., Banks, A., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C., Durinck, J., Felce, T., Fijn, R., García-Barón, I., Garthe, S., Geelhoed, S., Gilles, A., Goodall, M., Haelters, J., Hamilton, S. and Hiddink, J. (2020). Distribution maps of cetacean and seabird populations in the North-East Atlantic. *Journal of Applied Ecology*. 57. 253-269. Available at: <https://doi.org/10.1111/1365-2664.13525>. [Accessed 08 April 2026].

Wakefield, E.D., Owen, E., Baer, J., Carroll, M.J., Daunt, F., Dodd, S.G., Green, J.A., Guilford, T., Mavor, R.A. and Miller, P.I. (2017). Breeding density, fine-scale tracking, and large-scale modelling reveal the regional distribution of four seabird species. *Ecological Applications*, 27, 2074–2091.

Woodward, I., Thaxter, C.B., Owen, E. and Cook, A. (2019). Desk-based revision of seabird foraging ranges used for HRA screening. BTO Research Report, 724.

Woodward, I.D., Franks, S.E., Bowgen, K., Davies, J.G., Green, R.M.W., Griffin, L.R., Mitchell, C., O'Hanlon, N., Pollock, C., Rees, E.C., Tremlett, C., Wright, L. and Cook, A.S.C.P. (2023). Strategic study of collision risk for birds on migration and further development of the stochastic collision risk modelling tool (Work Package 1: Strategic review of birds on migration in Scottish waters). Report by British Trust for Ornithology, Royal Society for the Protection of Birds and ECO-LG to The Scottish Government, Crown Estate Scotland and The Crown Estate.