Chapter 11 Addendum: Offshore Ornithology

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

rps
A TETRA TECH COMPANY

JERA NEX BP

ESB Energy for generations

ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report - Addendum
Chapter 11 Addendum: Offshore Ornithology

MDR1520C
EIAR –
Chapter 11 Addendum
A1 C01
December 2025

rpsgroup.com

Contents

Figures

Tables

11. CHAPTER 11 ADDENDUM – OFFSHORE ORNITHOLOGY

11.1 Introduction

This Addendum provides supplementary information on the assessment of offshore ornithology included in chapter 11 of the Environmental Impact Assessment Report (EIAR)(2024). The supplementary information is provided in response to a Request for Further Information (RFI) from An Coimisiún Pleanála (ACP) (formerly An Bord Pleanála) on the planning application (case reference ABP-319799-24) for the Oriel Wind Farm Project (hereafter referred to as “the Project”).

Table 11A-1 provides details on the information requested, references where the information is provided in this Addendum to chapter 11 and provides a concluding statement on any resulting changes to the assessment provided in EIAR chapter 11 as a result of the supplementary information.

Table 11A-1 outlines the specific information requested according to the referencing used in the ‘Schedule-Further Information Request’ provided by ACP (e.g. 7.A which refers to inclusion/exclusion of species assessed for the Project). Table 11A-1 also indicates where the corresponding information / responses can be found within this Addendum to chapter 11 or within the Response to Submissions Report, and provides a concluding statement on any resulting updates or changes to the assessment presented in the EIAR (2024) (chapter 11: Offshore Ornithology (volume 2B)).

The headings and subheadings in this Addendum correspond to those used in chapter 11: Offshore Ornithology. However, within the ‘Assessment of Significance’ in section 11.10, one new impact assessment has been added in response to an information request. This new assessment covers ‘predicted mortalities in context of the western Irish population’ (section 11.10.6). Consequently, the numbering of the subsequent subheadings, including ‘mitigation and residual effects’ and ‘future monitoring,’ has been adjusted. The reader is directed to review the information presented in this Addendum alongside the assessment presented in the EIAR chapter 11.

Table 11A-1:Further Information requested on Offshore Ornithology and details on Applicant's response.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
7.A	From the information presented, the Board note concerns that there is an over-reliance on baseline surveys to include, and exclude, important features ecological potentially affected by the project. It is noted that species “recorded in very small numbers or very infrequently during the baseline surveys are excluded because the risk of impact to their populations is considered negligible.” The Board requires that a clear, evidence-based justification for the inclusion and/or exclusion of species is submitted, particularly given the risk of excluding species that are less readily sampled by the particular survey methodologies applied and given the location of the site partially within the North-west Irish Sea cSPA, and location relative to bird colonies at Rockabill SPA, Lambay Island SPA & Irelands Eye SPA.	See section 11.7.3, which provides a clear, evidence-based justification for inclusion/exclusion of species.	Clarifications and additional justifications for the inclusion and exclusion of species have been provided; these did not alter the list of species assessed and therefore did not change the conclusions presented in chapter 11: Offshore Ornithology of the EIAR.
7.B	It is noted that the surveys were undertaken prior to the 2022 Highly Pathogenic Avian Influenza (HPAI) season, which is known to have had significant negative impacts on range of seabird species. The applicant is requested to provide justification that the original digital area surveys and boat-based data remain relevant and appropriate at the point of submitting additional information to support the proposed development.	See section 11.7.4 which provides a justification that the data presented in the assessment remains valid.	The justification provided does not necessitate a change in the assessment or change the assessment conclusions presented in chapter 11: Offshore Ornithology.
Reference Population			
7.C	The robustness of population calculations used within Chapter 11: Offshore Ornithology, and associated appendices, is important in assessing the potential effects of the proposed development. While the Board notes the approach of estimating reference populations employed in the EIAR, the applicant is requested to provide further detail on the breeding season populations used - including both breeding adults and juveniles / immature birds - and how the figures have been derived. At present, it is not clear how juveniles have been treated in the population estimates. The applicant should provide evidence-based justification for the method applied, which	See section 11.7.3 which provides clarifications for the methods applied.	No change to conclusions previously presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	should comprise the most appropriate and precautionary method for estimating the breeding season populations to inform assessment conclusions. The applicant is requested to clearly present the values and equations used to derive the population estimates, including their sources (e.g. a list of colonies or sites included within the reference populations), to allow validation of the methodology. The applicant should also address this issue in the Cumulative Impact Assessment.		
Disturbance & Displacement			
7.D	The rationale for decisions to screen out bird species for assessment of disturbance and displacement if determined to have a low sensitivity to disturbance and displacement or which were recorded in low numbers is not clear, giving rise to concerns regarding the robustness of the conclusions in the EIAR and NIS. The applicant is requested to provide justification for the approaches taken for screening out in such instances.	See section 11.7.3 which provides clarifications for the methods applied.	No change to conclusions previously presented in chapter 11: Offshore Ornithology.
7.E	The Board notes the submission of Appendix 11- 07: Offshore Ornithology Apportioning Impacts to Individual Colonies of the EIAR which seeks to apportion predicted mortalities from displacement and collisions of the project to seabird colonies. In terms of disturbance and displacement, four species have been identified as potentially at risk: • Common Guillemot (*Uria aalge*); • Razorbill (*Alca torda*); • Great northern Diver (*Gavia immer*); and • Northern Gannet (*Morus bassanus*); The Board notes that the applicant has assessed predicted annual mortalities for a number of species based on a single mortality rate, rather than the industry recommended range of mortality rates. Chapter 11 of the EIAR bases conclusions on a rate of 50% displacement and 1% mortality rate for auks[1], 100% displacement and 0.5% mortality for great	The Applicant has provided, in section 11.10.1 of this Addendum, the estimated increase in baseline mortality for the four species referenced in 7.E, based on a minimum and maximum displacement and mortality rates. The Applicant notes that the assessment in chapter 11: Offshore Ornithology presents a range of mortality and displacement rates for the following species for the project-alone assessment: - Common guillemot - Razorbill - Great northern diver - Northern gannet However, the Applicant considers that drawing conclusions based solely on the maximum range of collision, displacement, and mortality rates is excessively precautionary, ecologically unrealistic, and does not align with current best practice/industry guidance. For example, a maximum mortality rate of 10% is not supported by any evidence and is	No change to conclusions previously presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	northern diver and 60% to 80% displacement and 1% mortality rate for gannet during the operational phase of the project. Given the location of the site partially within the North-west Irish Sea SPA (and proximity to colonies at Rockabill SPA, Lambay Island SPA & Irelands Eye SPA) the applicant is requested to update the EIAR to adopt a range of relevant mortality rates in the estimates of predicted mortalities for relevant species, and that these be clearly presented in the EIAR. *Footnote 1*: The SNCB (2022) recommend a displacement rate of between 30% and 70% and a mortality rate of 1% and Nature Scot 60% and 1% respectively	considered excessively precautionary. Therefore, the Applicant has presented the assessment of significance based on a single point estimate in chapter 11: Offshore Ornithology (EIAR volume 2B). In response to the request for further information, the Applicant has provided the increase in baseline mortality for the project alone using the maximum displacement and mortality rates for the four species below: - Common guillemot - Razorbill - Great northern diver - Northern gannet However, the Applicant believes that this Further Information Request is specifically around the Cumulative Impact Assessment (CIA) whereby a more realistic (and not worst-case) scenario was presented when considering the cumulative displacement impact. Due to the nature of five Phase 1 projects with connectivity to many of the same breeding colonies, there is not likely to be an additive impact – the birds can only be displaced once, they will not be displaced five times experiencing large levels of mortality from each project. Given the additive nature of the assessment it results in more birds being considered then is scientifically possible. Nonetheless, the Applicant has submitted an updated Cumulative Impact Assessment (CIA) that employs the same range of impacts as the standalone assessment, as outlined in appendix 3-2: Cumulative Impact Assessment Report (EIAR volume 2A Addendum).	
7.F	Dundalk Bay is noted to be a very important foraging area for birds, likely linked to the prey resources known to exist there, including spawning habitat of the Atlantic Herring *Clupea harengus*. The rate of displacement does not appear to have been fully considered in the context of potential indirect and cumulative effects of the project on birds, such as Manx Shearwater, who forage in Dundalk Bay in large numbers, where a low rate of displacement may induce a population-scale impact. The applicant is requested to address potential changes in the distribution and abundance of important prey populations on birds.	The Applicant confirms that an assessment of disturbance and displacement has been provided for common guillemot and razorbill, as both species use Dundalk Bay and forage on Atlantic Herring. Further information has been presented in response to comment 7.D in section 11.10.1 of this Addendum, including the percentage increase in baseline mortality for the Project alone based on the maximum range of displacement and mortality rates, which is considered ecologically unrealistic. However, Manx shearwater have not been specifically assessed for disturbance and displacement in the assessment (chapter 11: Offshore Ornithology), as they are not considered sensitive to these effects from operational offshore wind farms. There is no empirical evidence that Manx	No change to conclusions previously presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		shearwater avoids operational wind farms (Dierschke *et al.*, 2016, Deakin *et al*. and SNCB, 2022) and is considered to have a low sensitivity to displacement (Table 11-21 and 11-22 and associated text at the start of section 11.10.1 of chapter 11: Offshore Ornithology (EIAR volume 2B).. Within English and Welsh projects there has been a variation proposed, with Erebus and White Cross presented 1% mortality and 10% displacement as requested by NRW/Natural England, whereas Mona and Morgan were requested to use the auk rates by the JNCC, which is 30-70% displacement and 1-10% mortality, but with no evidence for these numbers. In response to the comments on Manx shearwater and other species, the Applicant has provided an assessment of the increase in baseline mortality for the project alone, using the maximum displacement and mortality rates for Manx shearwater, guillemot and razorbill. However, it is noted that Manx shearwater is not considered sensitive to displacement, and there is currently no evidence to support any specific range of displacement rates (e.g., 1–10%, 30–70%, or any other). The Applicant has provided, in section 11.10.1 of this Addendum, the estimated increase in baseline mortality for Manx shearwater, based on a minimum and maximum displacement and mortality rates. The applicant acknowledges the second part of 7.F, which addresses potential changes in the distribution and abundance of important prey populations affecting birds. The potential effects on fish species and their habitats have been assessed in full in chapter 9: Fish and Shellfish Ecology (EIAR volume 2B). Section 9.10 assesses the potential effects on seabirds in the context of how seabird prey species may be impacted through underwater sound and temporary habitat loss/disturbance and increased suspended sediment. The assessment has concluded a slight adverse impact on herring spawning during the construction and operation of the Project. This conclusion is incorporated into the offshore ornithology assessment to evaluate the indirect displacement of seabirds resulting from changes in prey availability and habitats. Section 11.10.2 of chapter 11: Offshore Ornithology, based on this assessment, determines that the effects on seabirds will be of no more than imperceptible or slight adverse significance during all phases of the Project. The Addendum	

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		to chapter 9: Fish and Shellfish Ecology does not change these conclusions.	
Collision Risk			
7.G	The Board notes the submission of Appendix 11-4 – Offshore Ornithology Collision Risk Modelling (CRM) which identifies five seabird species as potentially at risk due to their recorded abundance in the offshore wind farm area and their likelihood of flying at potential collision height (PCH) between the lowest and highest sweep of the WTG rotor blades above sea level: • Northern Gannet (*Morus bassanus*); • Kittiwake (*Rissa tridactyla*); • Common gull (*Larus canus*); • Herring gull (*Larus argentatus*); and • Great black-backed gull (*Larus marinus*). It is noted that the findings of the CRM rely on limited empirical data and avoidance rates for waterbirds which are not up to date. The level of confidence with regard to avoidance rates for a significant proportion of waterbirds is very low and this should be given due consideration when drawing conclusions on impacts. The use of the original Band (2012) model in its various forms may not be justified, and the Board is concerned that the conclusion of the applicants' assessment is not supported given the limitations identified. It is recommended that more appropriate methodologies are developed and implemented to gather relevant empirical data to support the assessment of effects, including updating all parameters using the most up to date empirical data, or if not appropriate, provide comprehensive justification for the methodology employed.	The assessment followed the best practice guidance at time of submission from the Department of Communications, Climate Action and Environment (DCCAE), Natural England and NatureScot, which is to use the Band model (2012) and its later iterations (Masden, 2015, MacGregor *et al.*, 2018 and Canceo, 2022). To the best of the Applicant's knowledge, no alternative has been used in impact assessments for projects in Ireland or the UK. Outside of Ireland or the UK, the Applicant has found examples of other European jurisdictions presenting the Band (2012) model or its various iterations. This includes the latest Dutch cumulative assessment (KEC 5.0, IJntema *et al*, 2025) and the Swedish Kattegatt Syd project (WSP, 2022). The Applicant would like to highlight that SNH in Scotland (NatureScot, 2023) and Natural England (Parker *et al*., 2023) recommend using the Band model to predict the number of collisions. Specifically, when it comes to avoidance rates the latest guidance has been followed by using two different options: one using species-group avoidance rates from Natural England and NatureScot, and the other using species-specific avoidance rates from Ozsanlav-Harris *et al*. (2023). The Applicant wishes to emphasise that the recommended avoidance rates are derived from empirical studies and represent the most up-to-date scientific evidence available. The Applicant acknowledges that in August 2024, following the submission of the Project application, the Statutory Nature Conservation Bodies (SNCB) in Britain issued a new document '*Joint advice note from the SNCBs regarding bird collision risk modelling for offshore wind developments*', which supersedes the previous guidance. This guidance from the SNCBs comprising JNCC, Natural England, Natural Resources Wales and NatureScot provides recommendations on how the Offshore Wind Farm (OWF) industry should apply the available evidence on turbine collision risk to the impact assessment process. This new guidance has been reviewed in full and does not necessitate any changes to the assessments presented in	No change to conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		chapter 11: Offshore Ornithology. Indeed, the Applicant notes that the new guidance (SNCB, 2024) makes only marginal changes to some parameters (for example, the 'all gull rate' in the stochastic CRM changed from 0.993 ± 0.0003 to 0.9929 ± 0.0003). These changes are not significant and would not materially affect the CRM outputs; consequently, no updated collision risk modelling has been undertaken and the assessment conclusions remain unchanged.	
7.H	In terms of the estimated collisions for the above bird species, the Board notes that Natural England have accepted a 70% reduction in Northern Gannet collision mortality estimates to account for macro-avoidance at previous developments, such as Hornsea 4. However, this is applied where developments are much further from the coast and from Northern Gannet colonies. Given the proximity of the project to the coast and to the gannet colony at Ireland's Eye SPA and Lambay SPA, approximately 52km to the south of the project site and within the foraging range of this species, a more precautionary approach is recommended. The applicant is requested to consider the approach taken in relation to Northern Gannet collision estimates, so they are not reduced by 70% to account for macro-avoidance.	The Applicant had included a no macro-avoidance scenario in appendix 11-4: Offshore Ornithology Collision Risk Modelling (CRM) (EIAR volume 2B). However, due to the implausibility for a bird to be both displaced and still be present within the site resulting in mortality due to collision, it was not presented in chapter 11: Offshore Ornithology (EIAR volume 2B). In response to the request for further information and applying the precautionary approach, the Applicant has provided an updated collision assessment which does not consider macro-avoidance in section 11.10.3 of this Addendum.	The updated collision risk assessment for Northern Gannet provided in this Addendum does not change the conclusions presented in the assessment.
7.I	The Board notes that a number of species have been screened out as being vulnerable to collision risk, where abundances are noted to be high or very high due to their flight behaviours and responses, particularly, tending to fly below the sweep of the turbine blades. It is noted that those include species associated with nearby SPAs. The applicant is requested to provide further information on the rationale to exclude certain species in terms of the abundances identified and where, in certain conditions, they may fly higher than expected. Where a species is numerous, modelling of collision risk may produce fatality estimates that are concerning for particular populations, the Manx Shearwater (*Puffinus puffinus*) for example (a Qualifying Interest (QI) of the North-west Irish Sea SPA and the second most frequently recorded species within the Offshore Ornithological Study Area). This concern should be	The Applicant has detailed their rationale for including or excluding species from the assessment in section 11.7.3 of this Addendum, and this is summarised as follows: Species recorded in very low numbers (fewer than 49 birds) during site-specific surveys were excluded from further consideration. For species observed in low (50 to 199 birds) to very high abundances (over 5,000 birds), a more detailed screening was carried out, taking into account each species' sensitivity and abundance within the array area. This approach ensures that the assessment focusses on species for which changes are expected to be detectable, given the abundance and the scale of the predicted impact. This approach follows widely adopted industry practice for determining which species are included in the assessment. Following this evaluation, the following species were screened out of collision impact: - Black guillemot	No change to conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	fully addressed and the EIAR and NIS revised accordingly.	- Common tern - Common scoter - Manx shearwater - Puffin Whilst Manx shearwater were observed in very high abundance during the site-specific surveys, they were excluded from the collision risk assessment process. This decision was based on findings by Wade *et al*. (2016), who evaluated the vulnerability of various seabird species to collision risks, particularly in the context of offshore wind developments and other anthropogenic structures. In their study, Manx shearwaters were identified as the least vulnerable seabird species to collision impacts. This lower vulnerability rating is likely due to their specific flight behaviours, flight altitudes, and avoidance capabilities, which reduce their likelihood of colliding with man-made structures. Consequently, despite their abundance in the area, Manx shearwaters were screened out from further collision risk assessment to focus resources and attention on species with higher vulnerability. Although this species was excluded from the collision risk assessment (7.E), it has been included into the displacement and disturbance assessment presented in section 11.10.1 of this Addendum. This assessment estimates the potential increase in baseline mortality, based on a range of minimum and maximum displacement and mortality rates. The NIS has been updated to incorporate the rationale outlined above, as detailed in the NIS addendum. With regards to height of flying birds, the Applicant acknowledges that this parameter is a key driver to collision risk models and the number of birds colliding with the rotating blades. The Applicant can confirm that they followed the SNCBs guidance and the flight heights used within modelling (in the Band 2 model) were taken from Johnstone *et al.* (2014) which took data from 32 different offshore sites' pre-construction surveys. This study used hundreds of thousands of observations of the flight height of birds in a range of weather conditions. This is the best available data and endorsed by the JNCC, Natural England, Natural Resources	

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		Wales and NatureScot in their latest guidance document (SNCB, 2024). In accordance with SNCB guidelines, the Applicant also presented collision mortality estimates using the Band 1 model, incorporating site-specific data on the percentage of birds flying within collision risk heights for gannet, kittiwake, common gull, herring gull, and great black-backed gull. These flight height measurements were obtained during the boat-based baseline characterisation surveys. Other species recorded during the surveys were observed in too low numbers to yield reliable estimates of the proportion flying at collision risk heights.	
7.J	Any potential specific mitigation measures to minimise the effects of the project on birds, such as painting of turbine blades, the use of curtailment systems in particular conditions or at particular times etc, if considered appropriate, should also be included and addressed in the application documentation.	The assessment of impacts has concluded that there are no significant effects with the implementation of the measures included in the Project. Therefore, no measures additional to those outlined in section 11.8.2 of chapter 11: Offshore Ornithology (EIAR volume 2B) are required. The Applicant would like to provide the following additional information concerning blade painting and the curtailment system, both of which have been taken into consideration. The theoretical amendments to blades to increase their visibility to birds is unproven in offshore environments (albeit some wind farms are testing the technology e.g. Ecowende). There is inconsistent evidence that increased contrast on the blades can reduce collisions within the onshore environment (May *et al*., 2020, Morkel *et al*., 2023 and RWE, 2025). Contrasting painting on the blades may increase visibility and therefore increase displacement impacts (e.g. greater distance over which susceptible birds could be displaced) which also contributes to the overall predicted impact of a project. Blade painting was considered as a mitigation measure but, owing to uncertainty over whether it would reduce net impacts (potentially trading reduced collisions for increased displacement), it was not adopted. This decision is consistent with current scientific knowledge on blade painting and the lack of clear evidence for its efficacy. Curtailment is used both onshore and offshore for several operational wind farms, but the mechanisms with which these are implemented are more difficult offshore (Van Bemmelen *et al*., 2022) compared to onshore (Garcia-Rosa and Tande,	No change to conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		2023[1]; BirdLife South Africa, 2025). The operation of offshore curtailment requires detailed understanding of the migratory movements, weather patterns and expert elicitation. Within the Netherlands curtailment rules to avoid high numbers of bird collisions are based on a simple threshold at a migration intensity of 500 birds/km/h, which translated to 3.8% of the total flux over the year (Van Bemmelen *et al*., 2022). Without this information on flux levels, there is no set criteria for when curtailment could occur in response to 'large' movements. The Applicant has presented two modelling options of how to account for migratory birds which both use the conservative approach of the whole population as the potential number of birds moving across the Irish Sea. Both of the models resulted in non-significant impacts of less than one whole bird per species per year and therefore there is no requirement to propose this mitigation. Given the unproven nature of these mitigation measures and the non-significant impact that is predicted from the Project, it is considered that there is no requirement to incorporate these technologies. However, the Applicant is committed to post-construction monitoring including review of requirement for on-turbine detection systems to improve understanding of risks to migrating birds and to inform adaptive management. Technologies under consideration include automated avian radar, thermal/infrared and high-resolution camera systems, and real-time detection/identification algorithms. Results from monitoring will be used to evaluate the need for, and the effectiveness of, adaptive measures (for example, targeted curtailment during periods of elevated risk) and to refine operational protocols where justified. See also appendix 5-16: Monitoring Programme (EIAR volume 2A Addendum)(prepared in response to RFI 1.D).	
Combined Disturbance and Displacement and Collision Risk			
7.K	**Northern Gannet (*Morus bassanus*) -** The Board notes that the overall impacts to species in terms of	The Applicant would like to confirm that the BDMPS work by Furness (2015) represents the best available evidence of how	No updates to assessment are presented in this Addendum and

[1] Garcia-Rosa, P.B. and Tande, J.O.G., 2023, October. Mitigation measures for preventing collision of birds with wind turbines. In Journal of Physics: Conference Series (Vol. 2626, No. 1, p. 012072). IOP Publishing.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	the predicted mortalities arising from displacement and/or collision events, are contextualised using the BDMPS as set out in Furness (2015). This area is significantly larger than the western Irish Sea and it is requested that the EIAR is revised to ensure that the assessment of predicted annual mortalities uses the western Irish Sea for context.	birds move during their non-breeding period and is endorsed in other jurisdictions (such as the SNBCs in the UK (e.g. NatureScot, (2023) and Parker *et al*. (2023)). For the breeding period, the Applicant has followed the NatureScot approach to contextualise impact within the breeding population. This method of estimating breeding population size, recommended by NatureScot in their guidance documents (Guidance Notes 3, 4, and 5) on assessing impacts on birds (NatureScot, 2023), was recently applied in the newly consented Mona and Morgan projects in the eastern Irish Sea. It represents the most robust and precautionary approach to generating breeding population estimates. Reference populations for both the breeding and non-breeding seasons were defined and applied in accordance with the best available scientific evidence and established industry practice. The Applicant does not consider the 'western Irish Sea' to be a biologically meaningful population unit for northern gannet given the species' large foraging range during the breeding season (up to 500 km) (Woodward et al., 2019) and seasonal movements from north Atlantic waters to southern Europe and Africa (e.g. Kubetzki et al., 2009; Deakin et al., 2019). Using a smaller area such as 'western Irish Sea' would needlessly assess the risk to a population that does not biologically exist. Nonetheless, to address ACP's request and ensure a comprehensive RFI submission, the Applicant has prepared and reported an assessment of the predicted annual mortalities contextualised to the 'western Irish Sea' (see section 11.10.6 of the Addendum).	therefore, there is no change to the assessment conclusions.
7.L	**Red-throated diver (*Gavia stellata*) -** Red-throated diver is identified as a QI for the Northwest Irish Sea SPA and a species known to be highly sensitive to offshore wind farm developments due to displacement effects. Recent empirical evidence indicates that the species avoids a larger area than the 4km buffer afforded in the EIAR and NIS, with a 10 km buffer being recommended as per UK Joint SNCB Interim Displacement Advice Note (2022). The EIAR indicates that the species was identified in low abundance (106 birds) in the north and west of the study area during the surveys. While noting the high sensitivity of the species to disturbance and displacement however, the low abundance recorded	The Applicant acknowledges that an assessment of displacement of red-throated diver was not presented within EIAR chapter 11: Offshore Ornithology. However, a full assessment was presented within sections 5.1.1.4 (construction) and 5.1.2.5 (operation and maintenance) of Natura Impact Statement (NIS) appendix H: Offshore Ornithology Supporting Information, which concluded no adverse effect on the site integrity of the North-west Irish Sea cSPA. To address the Board's request, the Applicant has screened in red-throated diver and has conducted an assessment of disturbance and displacement based on site-specific survey data within a 10 km buffer as recommended by SNCB (2022). The assessment encompasses the construction, operational,	As presented in section 11.10.1 of this Addendum, the assessment predicts that the disturbance and displacement of red-throated diver will have an imperceptible or slight adverse impact, which is not significant in EIA terms. While not appropriate for inclusion in this assessment, for completeness]the incorporation of the HiDef (2019) data into the assessment of red-throated diver would result in a non-significant impact to the non-breeding population.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	during site-specific surveys resulted in the species being screened out for EIA purposes. However, the 'Digital video aerial survey of birds in intertidal habitats of Gormanstown December 2018 to March 2019' (HiDef, 2019), commissioned by the Marine Institute, indicates the known extent of Red-throated Diver and their densities and shows the species concentrating in the shallow Dundalk Bay waters and in and around the proposed Oriel Project area. This survey data (HiDef, 2019) suggest that notable densities of the species may be present within 10 km of the array area. In this regard, the Board is concerned that the EIAR does not set out the recorded density values for this species and scopes out red-throated diver for further consideration in terms of disturbance, displacement and mortality. The applicant is requested to include the HiDef surveys in the assessment of potential impacts on red-throated diver and other North-west Irish Sea SPA QI species sensitive to displacement during both construction and operational phases of the project (e.g. Great Northern Diver *Gavia immer*, Common Scoter *Melanitta nigra*), in terms of predicted mortalities based on a displacement buffer of 10km with regard to the North-west Irish Sea SPA and consider the significance of the effects on this species for all seasons, individually and combined.	and maintenance phases of the project, detailed in section 11.10.1. The results of the HiDef surveys were deemed unsuitable for consideration in the assessment and a rationale for this is provided below. <u>HiDef survey data</u> The Project site-specific surveys recorded peak density of red-throated diver of 0.10 birds/km^2 during the boat-based surveys and 0.09 bird/km^2 during the DAS. In comparison the HiDef surveys in 2018/2019 (HiDef, 2019) recorded up to 3.45 birds/km^2 (in February 2019) which was associated with nearshore habitats within Dundalk Bay and potentially within 10 km of the Project. Georeferenced data is not available publicly so the Applicant is unable to directly map the data and determine how many birds were located within a 10 km buffer from the Project. Instead, the imagery was overlaid in GIS which identified that the area of highest density is around 8 km from the western boundary of the offshore wind farm area. However, the area of highest density also extends to 10 km from the offshore wind farm area. It is highly likely that where birds move away from the offshore wind farm area they would relocate into Dundalk Bay which supports this same population. The monthly surveys reported by HiDef (2019) indicate between 70-221 sightings which corresponds to a population estimate of 659 to 2,140 birds. This high level of monthly fluctuations indicates large levels of turnover with birds using multiple other areas along the east coast of Ireland. Counts within Liverpool Bay SPA also fluctuate each month indicating these birds are able to freely move between preferential areas to foraging during the winter months (HiDef, 2023). This habitat flexibility in addition to the small number of birds within the offshore wind farm area, indicates that the birds will be able to relocate to other areas to continue to forage during the winter months. The other species mentioned, common scoter and great northern diver, are not known to be impacted through displacement to 10 km; this displacement radius specifically applies to red-throated diver. The UK Statutory Nature Conservation Bodies (SNCBs) recommend a 4 km displacement radius for these two species (SNCB, 2022).	

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		Therefore the Applicant is not proposing to use a 10 km buffer for common scoter and great northern divers due to the lack of evidence supporting displacement beyond 4 km. Other qualifying species (i.e. guillemot and razorbill) from the North-west Irish Sea SPA species sensitive to displacement during both construction and operational phases of the Project have been assessed in section 11.10 of the chapter 11: Offshore Ornithology (EIAR volume 2B).	
7.M	**Black-legged Kittiwake (*Rissa tridactyla*) -** The Board note that Black-legged kittiwake, a species identified as being in decline, is a QI for North-west Irish Sea cSPA, as well as Lambay Island SPA and Ireland's Eye SPA, and that Black-legged Kittiwake has variable responses to offshore wind farms (OWFs). There is a colony in Northern Ireland which may also forage in this area. In this regard, the Board requests that the applicant include this species as a receptor of disturbance and displacement impacts during operation and maintenance. The scoping out of the species is considered to run contrary to the advice of NatureScot (2023) for species where both collision risk and displacement are considered. The applicant is requested to submit further information to identify and evaluate the impact of displacement of Black-legged Kittiwake in conjunction with collision risk. The application documentation should be revised to fully address the potential for significant impacts on this species.	The Applicant has considered and provided an updated displacement and disturbance assessment of kittiwake in section 11.10.1 of this Addendum. Based on this, the Applicant considers that the impact of displacement on kittiwake from the Project does not change the conclusions presented in the EIAR (see chapter 11: Offshore Ornithology), given the relatively small predicted impact (up to 11 birds annually). The Applicant must emphasise that there is a lack of empirical evidence indicating consistent displacement of kittiwakes. Some Before-After-Control-Impact (BACI) studies have found no impact or even an increase in kittiwake density following construction (APEM, 2017; Vanerman et al., 2013 and 2023). Consequently, there is conflicting guidance among the British SNCBs: NatureScot advocates for assessing disturbance and displacement, whereas Natural England (2022a, b, and c) and Natural Resources Wales (NRW, 2025) do not. The Applicant notes in DAU's submission to ACP on the Project (29/07/2024), a reference to the SNCB's advice to present collisions and displacement as additive. However, within the referenced SNCB advice note (Joint SNCB, 2022) kittiwake is identified as a species for which displacement assessments are not required. The Applicant considers the additive nature of both collision and displacement impacts as an impossibility as a bird cannot be both displaced and also susceptible to colliding with the turbine. Therefore, providing an additive combined impact is considered overly precautionary and likely to overestimate the impacts. However, to address the Board's request, the Applicant has provided below an assessment of the combined impact of collisions and displacement. As presented within the EIAR (see chapter 11: Offshore Ornithology) between 14.97 and 56.28 kittiwake have potential	As presented in section 11.10.1 of this Addendum, the assessment predicts that the disturbance and displacement of kittiwake will have an imperceptible or slight adverse impact, which is not significant in EIA terms. Furthermore as presented in section 11.10.4 of this Addendum, the effect of combined disturbance, displacement, and collision are predicted to be of slight adverse significance, which is not significant in EIA terms.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		to collide annually. As presented in section 11.10.4 of this Addendum, the combined mortalities of collisions and displacement was calculated at 14.97 and 67.28 per year. Where the worst-case of 67.28 birds are impacted the increase in baseline mortality would be 0.05 % increase in baseline mortality (when considering the population of 928,207 during the post-breeding season). An increase in natural mortality of 1% is considered to be the threshold for detectability within a population. Based on this, the Applicant considers that combined impact of collisions and displacement from the Project does not change the conclusions presented in the EIAR (see chapter 11: Offshore Ornithology), given the relatively very small increase in baseline mortality.	
7.N	**Great Northern Diver (*Gavia immer*) –** The Board note that the application area is important for wintering Great Northern Divers, a species known to be vulnerable to disturbance, including from construction activities and associated vessel movements as well as during the operational phase of the project. Bird Watch Ireland raise concerns about this Annex I species who consider that the concentration of this species in the outer Dundalk Bay may reach thresholds for international importance. A 'no mitigation' approach as proposed, particularly during the construction and operational phases is not considered appropriate. The applicant is requested to address these concerns, particularly in terms of the cumulative unknowns identified in the EIAR.	The Applicant has fully assessed the impact on great northern diver within chapter 11: Offshore Ornithology (EIAR volume 2B) which looked at the maximum impact on this species from the construction and operation of the Project. The assessment of impact has concluded that there are no significant effects with the implementation of the measures included in the Project. Therefore, no measures over those outlined in section 11.8.2 of chapter 11 are required. As a standard practice, when impacts are assessed as not significant, mitigation measures are typically not required to address residual effects. The Applicant emphasises that construction at the landfall will not occur during winter months to reduce impacts on intertidal birds. Nearshore great northern diver will also benefit from this mitigation measure with no disturbance from works at the landfall location occurring. The Applicant acknowledges the concerns raised regarding the cumulative impacts on great northern divers. However, there were no estimates of the numbers of great northern diver likely to be affected by other projects within the Cumulative Offshore Ornithology Study Area; accordingly, the assessment was prepared using the best available scientific evidence at the time of drafting. The Applicant remains committed to ongoing engagement with relevant stakeholders and to monitoring emerging literature, incorporating new data as it becomes available.	No change to conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
7.O	**Colonies at Rockabill –** the applicant is requested to provide additional information on the movement of auks (Guillemots (*Uria aalge*) and Razorbills (*Alca torda*)) from Lambay to show that there is no significant impact on the Rockabill, Lambay and Irelands Eye populations, given their range of foraging grounds, including the area of the project.	The Applicant provides the following justification as to why no additional information on the movement of auks has been provided in this Addendum. All of these colonies have been included within the assessment of significance as they are designated sites and relevant qualifying features for the offshore ornithology chapter (see Table 11-8 in chapter 11: Offshore Ornithology (EIAR volume 2B). The Applicant believes that further colony-specific tracking data are not required. The assessment was undertaken using the best available scientific evidence and established methods, which provide a robust basis for the conclusions reached. It should be noted that apportioning to individual colonies does not reflect colony-specific tracking work because tracking datasets are often small and therefore may not provide reliable colony-level estimates. The use of novel data (e.g. tracking work) does not change how the impacts are assessed. The offshore wind farm area falls within the foraging ranges of the species and colonies mentioned in the RFI, and these species and colonies have been fully assessed in the EIAR. The calculations of species foraging range uses thousands of tracks of birds throughout the UK and Ireland (Woodward *et al*., 2019) which is then used in a precautionary manner within the apportioning assessment (appendix 11-7: Offshore Ornithology Apportioning Impacts to Individual Colonies). The apportioning work indicates that 60% of razorbill and 72% of guillemot originate from Lambay and therefore 60% and 72% of the impacts are predicted to this island so have been given full consideration. Similarly for Ireland's Eye, 4% and 9% of razorbill are from that island. The Applicant wishes to clarify that, according to the Seabird Monitoring Programme, there are no records of guillemot or razorbill nesting on Rockabill. A large proportion of the birds located within the Offshore Ornithology Study Area are likely to originate from Lambay and Ireland's Eye and they have already been assessed as outlined above As such, there is no requirement to present tracking data.	No change to conclusions presented in chapter 11: Offshore Ornithology.
7.P	**Other -** The waters in and adjacent to the proposed Oriel Wind Farm are an important resource for the western Irish Seas marine bird populations. The passage of marine birds through the development	The Applicant has provided in section 11.10.1 the increase in baseline mortality for the Project alone using the maximum displacement and mortality rates for the four species below: - Common guillemot:	No change to conclusions presented in chapter 11: Offshore Ornithology

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	area does not appear to have been fully characterised because of the data regime adopted. It is requested that the EIAR adopt a range of relevant mortality rates in the estimates of predicted mortalities for relevant species and that the EIAR is revised to ensure that the assessment of predicted annual mortalities uses the western Irish Sea for context. It is recommended that the developer cross reference to NPWS Article 12 reports which provide information on the current status, pressures and future prospects for sea birds.	- Razorbill: - Great northern diver - Northern gannet In lieu of using the western Irish Sea as a population area, the Applicant has used the foraging range population (i.e. total number of birds from colonies within foraging range of the array area) during the breeding period, and during the non-breeding period an adapted population estimate from Furness (2015) has been utilised. The populations within Furness (2015) did not fully account for all of Ireland and therefore the Applicant (along with the other Phase 1 developers) have recalculated the populations within Furness (2015) to provide a robust non-breeding season population. Furness (2015) is the recommended approach by the UK SNCBs (Parker et al. 2023 and NatureScot, 2023) as the basis for the non-breeding season definitions and it adequately captures the emigration and immigration that occurs during the winter months into biologically defined areas (usually using waters to the west of Britian and the waters to east of Britian). Using Furness (2015) for the non-breeding season assessments has scientific precedent and accepted on all consented offshore wind projects since 2015. As noted above, it is the Applicant's position that there is no biological reasoning for using an anthropogenically defined area 'western Irish Sea'. For example, Northern gannets travel vast distances during the breeding season (up to 500 km) (Woodward et al., 2019) and migrate from north Atlantic waters to southern Europe and Africa (e.g. Kubetzki et al., 2009; Deakin et al., 2019). Consequently, restricting the assessment to a smaller area like the western Irish Sea artificially fragments a population that does not biologically exist at this scale, thereby unnecessarily increasing perceived risks. Nonetheless, to address ACP's requests and ensure a comprehensive RFI submission, the Applicant has prepared and reported an assessment of the predicted annual mortalities contextualised to the 'western Irish Sea' (see section 11.10.6 of the Addendum).	
7.Q	The applicant is requested to provide further analysis of the potential effects of the proposed development	Neither the HiDef (2019) study nor the ObSERVE Phase II data adequately covers the Offshore Ornithology Study Area	No change to conclusions presented in chapter 11: Offshore Ornithology

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	in relation to predicted mortalities from both collision and displacement impacts for relevant species. This should, at a minimum, incorporate the relevant available data including for example, HiDef (2019) and ObSERVE Phase II data where appropriate. Graphical representation Population Variability Analysis (PVA) results are considered to be of assistance to interpret model outputs where appropriate.	to allow for a comprehensive baseline characterisation. As outlined by DCCAE (2018), surveys must cover at least 15% of the target area to provide a reliable population. Neither HiDef or ObSERVE Phase II were undertaken at a resolution that could characterise the offshore wind farm area and therefore are not useful for an impact assessment (See Figure 11A-1) For example, ObSERVE Phase II has a single transect within Stratum 5 which overlaps with the Offshore Ornithology Study Area, a single transect is not representative. Similarly, there are five transect lines from the HiDef (2019) surveys which overlap with the Offshore Ornithology Study Area, this is not representative enough to produce a population estimate which can be used within an assessment. An assessment of impact must be based on data that represents the populations found within the study area (DCCAE, 2017 and 2018). As the increase in baseline mortality was below 1%, the Applicant did not undertake Population Viability Analyses (PVA). According to guidelines established in England and Wales (Parker et al., 2022), a threshold of a 1% increase in baseline mortality triggers the requirement for PVA. This threshold has been accepted by NRW and the JNCC and is widely applied in assessments for offshore wind farms in other jurisdictions such as the UK.	
7.R	**Light-bellied Brent Goose (*Branta bernicla hrota*) -** The Board notes the results of the vantage point surveys undertaken to establish the migratory movements of Light-Bellied Brent Geese across Dundalk Bay during the spring and autumn migration periods (EIAR Appendix 11-3: Migratory Geese Survey Report). The observed movements of birds, low and close to the shoreline, likely reflect commuting movements of flocks aligned to tidal cycles and movement between established foraging areas in Dundalk Bay and Carlingford Lough, while the significant migratory move of the 14/15th April would coincide with the northern migration of light-bellied brent geese. Autumn movements are noted to be different to the spring movements, particularly in terms of the volume of birds and sites being used	The Applicant's surveys of light-bellied brent geese were designed to understand the timing of their movements within and outside of Dundalk Bay, rather than to assess migratory movements through the offshore wind farm area. This distinction has caused some confusion regarding the surveys' objectives. The survey aimed to observe light-bellied brent geese, along with selecting secondary species, to determine flock sizes and the timing of their movements into Dundalk Bay (see section 1.2 of appendix 11-3: Migratory Geese Survey Report (EIAR volume 2B). The Migratory Geese Survey was not intended to quantify overall migration patterns but to document movements between vantage point locations throughout Dundalk Bay. Accordingly, the Applicant reiterates that the use of vantage point surveys remains appropriate and justified.	No change to conclusions previously presented.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	from Strangford Lough and south towards Dublin and Wexford. The Board note the primary survey method of coastal vantage point surveys by human observers, at a distance of between 6-12km from the project site, and which the DAU have considered to be insufficient, with concerns that this methodology could discount the potential for the geese, and other species, to fly through the proposed array area. Reliance on published literature does not provide detailed or precise data movements, and as many of these movements occur overnight, the routes taken are not known. Therefore, and based on known flight heights and potential flightlines between the major concentrations in Strangford Lough and sites along the East Coast of Ireland, there is potential for there to be a significant potential for large numbers of Brent geese flying through the proposed array area during both day and night, over very short timescales, and particularly in autumn. The potential impact of siting wind turbines on a migratory route for this species without appropriate mitigation during such short-term events could be potentially catastrophic for Light-Bellied Brent Geese populations, the vast majority of which winter in Ireland. The applicant is requested to address these concerns in relation potential effects of the project on migrating geese. Any potential specific adaptive mitigation measures to minimise the effects of the project, particularly during the Spring and Autumn migrations and which identify the timings of the migrations, depletion of food supply etc, should also be included and addressed in the EIAR.	Further offshore vantage point surveys (cable corridor) were conducted bi-monthly from October 2023 to March 2025 from a single fixed Vantage Point (VP) at Dunany Point. This VP consisted of a 2 km viewshed (with a 180° viewing arc) covering an area of the offshore cable corridor located between the landfall location and the Offshore Ornithology Study Area / Boat-based and Aeriel Survey Area defined in chapter 11: Offshore Ornithology (EIAR volume 2B). The survey results indicated a low passage of brent geese, with a peak count of 310 individuals in January 2024. These observations are reported in appendix 19-1 Addendum: Onshore Biodiversity — Supporting Information (EIAR volume 2C Addendum). The Applicant undertook an assessment of migratory collision risk within appendix 11-6: Offshore Ornithology Migratory Non-Seabirds Collision Risk Modelling, which assessed the entire population of light-bellied brent goose within Ireland and the proportion of those birds which may migrate down the east coast of Ireland. This was the best available model at the time of submission. An updated version, incorporating the work of Woodward *et al*. (2023) and building upon the SOSSMAT framework, has been completed and is presented in appendix 11-9: mCRM. To model the movements of migratory birds within the footprint of the project, the Marine Scotland Avian Migration Collision Risk Model Shiny Application, hereafter referred to as the mCRM tool ("mCRM App"; HiDef Aerial Surveying Ltd., 2024), was employed. This Marine Scotland mCRM tool is the most advanced, robust yet precautionary way to quantify impacts to migratory species by making several assumptions about flight paths and species avoidance rates. The mCRM tool generates robust population estimates, of birds passing through the array area, using a bootstrapping technique which randomly samples 1000 potential flight lines. These flight lines are generated from 10,000 random lines that comprise a birds' potential migration pathway to and from Ireland (and the UK). Furthermore, the default avoidance rates set within the mCRM tool are used for each species. These values have been checked by an ornithological expert (Cook per comms) and closely align with NatureScot guidance (NatureScot, 2023) which is based on several literature sources that incorporate	

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		collision data from all suitable terrestrial, coastal and marine offshore wind farms. The predicted impact is minor and not significant for Canadian light-bellied brent goose, with up to 0.012 (± 0.006 Standard Deviation (SD)) individuals predicted to be impacted during the pre-breeding season and 0.012 (± 0.006 SD) individuals predicted to be impacted during the post-breeding period (when considering an avoidance rate of 0.999 ± 0.0001 SD) (North Irish Sea Array Windfarm Ltd, 2025). In relation to tracking data, although it can contribute to knowledge of the local patterns of light-bellied brent geese which potentially move across the offshore wind farm area, tracking data was not collected for the Project. Data recorded by the Irish Brent Geese Research Group shows that movement down the east coast of Ireland occurs close to land. Additional tracking work is not a requirement to complete a robust assessment on light-bellied brent goose, as the migratory collision risk modelling used to inform the assessment (see appendix 11-6: Offshore Ornithology Migratory Non-Seabirds Collision Risk Modelling) is considered a robust and comprehensive way to assess the potential for impacts. Based on the non-seabird collision risk modelling (appendix 11-6: Offshore Ornithology Migratory Non-Seabirds Collision Risk Modelling (EIAR volume 2B)) which takes account of the international population estimates for light-bellied brent geese, effects would be negligible (almost undetectable). As the assessment of impact for geese has concluded that there are no significant effects with the implementation of the measures included in the Project, no measures over those outlined in section 11.8.2 of chapter 11: Offshore Ornithology are required. As a standard practice, when impacts are assessed as non-significant, mitigation measures are typically not required to address residual effects. However, the Applicant is committed to post-construction monitoring including review of requirement for on-turbine detection systems to improve understanding of risks to migrating geese and to inform adaptive management. Technologies under consideration include automated avian radar, thermal/infrared and high-resolution camera systems, and real-time detection/identification algorithms. Results from	

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		monitoring will be used to evaluate the need for, and the effectiveness of, adaptive measures (for example, targeted curtailment during periods of elevated risk) and to refine operational protocols where justified. See also appendix 5-16 Addendum: Monitoring Programme (prepared in response to RFI 1.D).	
Migratory Species – Non seabirds			
7.S	The Board notes the international importance of Ireland, including Dundalk Bay SPA, for a range of waterbird species. The AA screening report does not detail the potential impacts upon and interactions of the proposed project with migratory waterbirds, with a focus on foraging and breeding birds only. It is noted that all migrating birds have been scoped in for further assessment, which is welcome, but the applicant is requested to update the AA to include a reference to potential impacts and interactions with regard to migratory waterbirds which are SCIs of SPAs. A review of the screened-out Natura 2000 sites and water bodies is required to be undertaken to ensure that the NIS has considered all relevant pathways appropriately, as well as migratory or normal flight paths of avian species.	A review of the migratory bird species as SCIs of screened-out Natura 2000 sites was completed in the Report to inform Appropriate Assessment Screening Addendum.	n/a
7.T	The applicant is further requested to clearly address the potential for ex situ impacts upon species listed for Dundalk Bay SPA that occur outside the red-line boundary.	The Dundalk Bay Special Protection Area (SPA) supports wintering waders and wildfowl species. The NIS provides an assessment of the effects of displacement and disturbance, collision risk, and barrier effects on the qualifying features of the SPA where an impact pathway exists. For broader impacts occurring over a wider area, such as indirect displacement resulting from changes to prey and habitats, the assessment refers to findings from other assessments: - Fish and Shellfish Ecology; - Marine Processes; and - Benthic, Subtidal and Intertidal Ecology. to inform ex-situ impacts. These assessments provide information on ex-situ impacts—effects that occur outside the immediate SPA area. The assessment concludes that there is no potential for the	No change to conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		habitats and prey of the SPA's qualifying species within Dundalk Bay to be affected by the Project's zone of influence.	
7.U	The Board has concerns regarding the methodologies employed with regard to the survey and monitoring of the movement of migratory waterbirds at key migration times. The primary survey method of coastal vantage point surveys by human observers, at a distance of between 6-12km from the project site, and which appear to primarily focus on geese, is considered to be insufficient and inappropriate to assess the migratory movements of birds through the array area, and the potential impacts on these species. In addition, the reliance on literature to fill knowledge gaps, while useful, does not provide adequate data to ensure a comprehensive assessment of potential effects on birds. The applicant is requested, having regard to the comments above, to address the purported existing data gap to enable the assessment of potential impacts of the proposed development on migratory birds. Radar (horizontal and vertical surveys) or similar at the Array Area during peak migration periods might be utilised to provide site-specific data, which could be used to support the applicant's current assessment and provide quantitative information on passage of birds to feed into collision modelling. Should radar not be conducted and an alternative survey methodology utilised, comprehensive justification for the alternative should be provided. Peak migration periods during which data are to be collected can be further informed through review of existing data and published literature relevant to the project area and region. Whilst the DAU makes reference to the key migration times being spring and autumn, the Board considers that migration information during the winter months would also be of assistance to the assessment (e.g. irruptive cold weather movements from the continent and UK). The applicant is invited consider this aspect for inclusion also.	The Applicant's surveys of light-bellied brent geese from coastal vantage point surveys were designed to understand the timing of their movements within and outside of Dundalk Bay, rather than to assess migratory movements through the offshore wind farm area. This distinction has caused some confusion regarding the surveys' objectives. The survey aimed to observe light-bellied brent geese, along with selecting secondary species, to determine flock sizes and the timing of their movements into Dundalk Bay (see section 1.2 of annex 3: Migratory Geese Survey Report (appendix H: Offshore Ornithology Supporting Information). The Migratory Geese Survey was not intended to quantify overall migration patterns but to document movements between vantage point locations throughout Dundalk Bay. Accordingly, the Applicant reiterates that the use of vantage point surveys remains appropriate and justified. The Applicant does not agree that there is a data gap in the assessment of migratory waterbirds, nor that site-specific data is necessary to inform the assessment of migratory birds. The Applicant undertook an assessment of migratory collision risk within annex 6: Offshore Ornithology Migratory Non-Seabirds Collision Risk Modelling (appendix H: Offshore Ornithology Supporting Information) using the SOSSMAT framework, which assessed the entire population of migratory birds within Ireland and the proportion of those birds which may migrate down the east coast of Ireland. This was the best available model at the time of submission. An updated version, incorporating the work of Woodward *et al*. (2023) and building upon the SOSSMAT framework, has been completed and is presented in annex 9: Offshore Ornithology Migratory Collision Risk Modelling: Phase One Projects Cumulative Assessment (North Irish Sea Array Windfarm Ltd, 2025). To model the movements of migratory birds within the footprint of the project, the mCRM tool ("mCRM App"; HiDef Aerial Surveying Ltd., 2024), was employed. Both of these models indicate a negligible impact when considering the movement of the entire migratory waterbird populations.	No change to conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
		The Applicant has provided information on the feasibility of radar technologies, alongside other potential methods within section 11.6.2.	
7.V	In terms of the findings of the Migratory Non-Seabirds Collision Risk Modelling (Appendix 11-06 of the EIAR), and noting the comments in the DAU submission, the conclusions arrived at in this regard, may rely on limited empirical data and the avoidance rates applied in the model for waterbirds are not up to date. The level of confidence with regard to avoidance rates for a significant proportion of waterbirds is very low and as such, the validity of the conclusions arrived at are potentially understated. It appears therefore, that the conclusion of the NIS may not be fully supported given the limitations identified. The applicant is requested to address these concerns, having regard to the DAU submission.	The Migratory Non-Seabirds Collision Risk Modelling (annex 6 of the NIS) is based on the best available evidence to date. It follows the SOSSMAT guidance, which incorporates a comprehensive review of migratory lines (Wright *et al*., 2012) and a range of avoidance rates drawn from empirical studies, ensuring that the assessment is grounded in the most current and reliable scientific data The Applicant presented a range of avoidance rate (in line with SOSSMAT guidance, Wright *et al*., 2012), between 0 and 99%. For the assessment the 95% avoidance rate was used. The avoidance rates recommended within the latest report (Table 5 of Woodward *et al*., 2023) indicate that the lowest avoidance rate for any species within the tool is 98.01 ± 0.32% (for mallard). The lower confidence interval of the lowest avoidance rate as determined by Woodward *et al.* (2023). is therefore 97.69%. The Applicant's approach of presenting 95% avoidance can therefore be deemed to be precautionary. An updated version, incorporating the work of Woodward *et al*. (2023) and building upon the SOSSMAT framework, has been completed and is presented in Appendix 11-9: mCRM (Migratory Collision Risk Modelling: Irish East Coast Phase One Offshore Wind Projects Cumulative Assessment). To model the movements of migratory birds within the footprint of the Project, the Marine Scotland Avian Migration Collision Risk Model Shiny Application, hereafter referred to as the mCRM tool ("mCRM App"; HiDef Aerial Surveying Ltd., 2024), was employed. The update of the mCRM presented in appendix 11-9 predict smaller impacts for all species and there is therefore no changes to the conclusions of the assessment.	No change to conclusions previously presented.
7.W	The applicant is requested to justify the screening out for further assessment of all passerines (Table 11-15 of the EIAR), which considers the risks to migrating passerines as negligible 'due to the relative size of the project and the behaviour of the birds (e.g. passage movements restricted to twice annual events, large population sizes and flight heights	See section 11.8.3 of this Addendum where the Applicant has provided additional rationale for the screening out of passerines form the offshore ornithology assessment	No change to the assessment conclusions.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	typically above risk height)'. It is noted that many hundreds of thousands of migrants come to Ireland for the winter, moving west as autumn progresses and returning north and east as spring advances. The applicant is requested to provide more information and assessment with regard to these species and to consider the potential effects of the development at the project level as well as cumulatively.		
Terrestrial Bird Species			
7.X	Chapter 19 of the EIAR considers the potential effects of the project on onshore birds and intertidal birds and includes Appendix 19-02: Intertidal Bird Survey and Onshore Bird Survey Reports. The DAU note that the focus of data collection to support the application has been on marine-dwelling avifauna as opposed to land-based avifauna, with knowledge gaps with respect to transboundary and migratory movements of land-based avifauna in Irish waters and beyond. As such, it is noted that no new empirical data have been collected for land-based migratory birds as part of the monitoring programme, to detect and assess the level of bird migration through the proposed development site area. This would provide a better understanding of the potential impact and cumulative impacts of the project, and other ORE developments in terms of the Irish Sea. The applicant is requested to address these concerns, including those raised in the DAU submission on the project.	The assessment of migratory movements has been carried out using the Strategic Ornithological Support Services (SOSS) Migration Assessment Tool (hereafter referred to as SOSSMAT). To the Applicant's best knowledge, no alternative tools are available and the SOSSMAT tool is based on the latest scientific evidence. This tool is widely used in offshore assessments and adheres to the recommended guidelines in the UK (see Natural England's guidance (Parker *et al*., 2023) and NatureScot Guidance Note 7 (NatureScot, 2023)), noting that no equivalent guidance currently exists in Ireland. Therefore, the Applicant maintains that the application documents present a robust and valid assessment of protected bird species migrating to and from Ireland, following best practice guidelines. Section 11.6.2 of this Addendum provides further justification as to why no new empirical data on bird migration was required to assess the potential impact on migratory birds.	No change to assessment conclusions presented in chapter 11: Offshore Ornithology.
7.Y	The CRM identifies terrestrial bird species as being vulnerable to wind turbines, including Corncrake (*Crex crex*), Merlin (*Falco columbarius*) and Hen Harrier (*Circus cyaneus*). However, the predictive power of the model employed is low, particularly for species that are not foraging in the offshore area. As such, the use of SOSS2 Migration Assessment Tool (SOSSMAT) may not have incorporated the most up-to-date estimates of flight speeds for migrating species and may not provide robust yearly collision estimates for land-based birds with a high degree of confidence. It is requested that the potential	The assessment of migratory movements has been carried out using the Strategic Ornithological Support Services (SOSS) Migration Assessment Tool (hereafter referred to as SOSSMAT). This tool is widely used in offshore assessments and adheres to the recommended guidelines for offshore wind farms in the UK (see Natural England's guidance (Parker *et al*., 2023) and NatureScot Guidance Note 7 (NatureScot, 2023)), noting that no equivalent guidance currently exists in Ireland. The Applicant confirms that the most up-to-date flight speeds, or suitable proxies where specific flight speed data were unavailable, were used for the species assessed, including	No change to assessment conclusions presented in chapter 11: Offshore Ornithology.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	operational impacts of the project on migratory movements/passage of land-based birds and potential options for on-site monitoring of species, etc be addressed within the application documentation.	corncrake (*Crex crex*), merlin (*Falco columbarius*), and hen harrier (*Circus cyaneus*). Therefore, the Applicant maintains that the application documents provide a robust and valid assessment of protected bird species migrating to and from Ireland, in accordance with best practice guidelines. The Applicant reiterates that no site-specific surveys (i.e. on-site monitoring) are necessary to robustly assess the collision risk to migratory birds. The Applicant directs the board to section 11.6.2 of this Addendum which provides further justification.	
7.Z	In terms of proposed works within the intertidal environment, the applicant is requested to clarify the timing of works, particularly in relation to the landfall location. The Board notes that the summary of potential environment effects, mitigation and monitoring (Table 19-18 of Chapter 19: Onshore Biodiversity of the EIAR) indicates that timing of the construction/operational works may influence the magnitude in terms of commuting, foraging, breeding and migratory birds in terms of disturbance and loss or fragmentation of habitat. Noting the measures included in the project, it would appear that the timing of works will be restricted to a very short window. The applicant is therefore requested to submit a draft programme of works which provide a clear intention in terms of mitigating effects on birds.	See Chapter 19 Addendum: Onshore Biodiversity for a response to this item.	n/a
Cumulative & Transboundary Effects			
7.AA	<u>Migratory Waterbird Species:</u> Migratory birds have not been included in the Cumulative Impact Assessment presented in the application documentation. As stated previously (Migratory Species – Non seabirds points S to W and Terrestrial Bird Species points X to Z), the assessment of the impact on migratory birds (both terrestrial and waterbird groups) arising from the project alone appears to be insufficient, and that further data should be provided to inform the assessment. The applicant is requested to assesses cumulative impacts to migratory bird populations, considering effects of the Irish Sea Phase 1 ORE projects and other existing or currently proposed plans and	An updated version, incorporating the work of Woodward *et al.* (2023) and building upon the SOSSMAT framework, has been completed and is presented in appendix 11-9: mCRM . To model the movements of migratory birds within offshore wind farm area (array area), the Marine Scotland Avian Migration Collision Risk Model Shiny Application, hereafter referred to as the mCRM tool ("mCRM App"; HiDef Aerial Surveying Ltd., 2024), was employed. The cumulative impact of the other east coast Phase 1 Projects and the Project is presented in Table 3 in Appendix 11-9: mCRM.	No change to the assessment conclusions.

Reference	Request for Further Information	Response / Reference where further information is presented	Concluding statement
	projects that may affect the same migratory populations.		

11.2 Purpose of this chapter

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.3 Study Area

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.4 Policy context

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.5 Consultation

Table 11A-2 provides a summary of further consultation undertaken with NPWS in October 2025 i.e. post application.

Table 11A-2: Summary of key issues raised on Offshore Ornithology.

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where consider in this Addendum
October 2025	National Parks and Wildlife Service (NPWS) –meeting. Discussion of DAU submission and approach to RFI response.	Collision risk to migratory birds; Kittiwake displacement and combined displacement / collision; Construction at the landfall location.	Collision risk to migratory birds has been assessed in section 11.10.3 of this Addendum, while section 11.7.3 provides a clear, evidence-based justification for inclusion/exclusion of species with regards to this assessment. Disturbance and displacement impacts to Kittiwake have been assessed in section 11.10.4. Regarding construction at the landfall location, the Project proposes to use open cut trenching to install the export cable in the intertidal area. An ecologist will supervise works. Habitat at the landfall is expected to recover quickly. Justification as to why HDD is not feasible from an engineering perspective was requested from NPWS and it is provided in chapter 5 Addendum: Project Description (EIAR volume 2A Addendum). Measures relating to timing of works at the landfall to reduce disturbance of bird species using adjacent subtidal waters are outlined in chapter 19 Addendum: Onshore Biodiversity (EIAR volume 2C Addendum).

11.6 Methodology to inform the baseline

11.6.1 Desktop study

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.6.2 Site-specific surveys

In response to points 7.U, 7.X and 7.Y, the Applicant would like to clarify the rationale for not undertaking baseline surveys (e.g. using radar) for migratory birds (both terrestrial, marine and intertidal) which are known to migrate over the Array Area.

A comprehensive assessment of the impact of the Project on all migratory species has been undertaken as part of the EIAR in accordance the current UK guidance (Parker *et al*, 2022 and NatureScot, 2023), noting there is no guidance equivalent or relevant guidance in Ireland. This is detailed in chapter 11: Offshore Ornithology (see EIAR volume 2B). The assessment of migratory species is supported by appendix 11-6: Offshore Ornithology Migratory Non-Seabirds Collision Risk Modelling which uses the Strategic Ornithological Support Services Migration Assessment Tool (SOSSMAT) method.

For migratory waterbirds, there is no guidance or requirement to undertake site-specific surveys (within the array area) to estimate migratory movements of birds during the migration periods for baseline characterisation as the endorsed models provide enough certainty to draw conclusions. The published guidance on how to take account of migratory movements of birds is widely accepted within the UK (see Natural England's guidance (Parker et al., 2023[2]) and NatureScot Guidance Note 7 (NatureScot, 2023[3]) (noting there is no guidance in Ireland). The method of assessing migratory movements is via the Strategic Ornithological Support Services (SOSS) Migration Assessment Tool (hereafter referred to as SOSSMAT), or the more recent Woodward et al., 2023 work, which is based on the same principles as the SOSSMAT tool. The SOSSMAT tool was used to assess migratory movement for the Project. No other robust method has been routinely used to quantify the impacts on migratory birds in assessments of offshore wind farms.

The request to gather empirical evidence within the offshore wind farm area is noted, however the Applicant is not aware of any guidance or precedent on how to analyse this data. If the Applicant was to use novel technologies like radar or acoustic monitoring, there is little to no application/use for this collected data in terms of an impact assessment. The technologies currently in use mainly in the European North Sea (see Welcker and Vilela, 2020[4]) enable information on timings of movement, the environmental variables which correlate with peak movements, the density of bird movements and the identification of species that migrate. To date, all technologies used to monitor nocturnal migration have been unable to provide an accurate count of the number of birds present. The models developed by SOSSMAT and updated by Woodward *et al*. (2023), have looked at these empirical studies and included information on these flight movements. Using the population estimates from national or regional studies (e.g. AEWA CSR 8[5]) allows the entire population to be considered and is proportionate to the risk as there is potential for the whole population to move through an area.

Therefore, the Applicant considers that the current assessment adequately addresses the potential impacts on migratory birds. The baseline data is based on well-established regional migration patterns and provides a robust foundation for the collision risk modelling conducted using the SOSSMAT tool. Although radar surveys can offer additional site-specific data, their effectiveness is limited due to the offshore location of the project, challenges in species identification, and weather interference. Given the strong existing evidence base on migratory movements (Wright et al., 2012), such surveys would likely not alter the assessment. With regard to the inclusion of cold-weather movements, as requested by the Board in section 7U, irruptive movements are considered infrequent and limited to a few broadly migrating species. This makes it unlikely that site-specific surveys would capture their timing. Therefore, collecting additional data during the winter period is unlikely to materially affect the conclusions of the assessment.

---

[2] Parker, J., Banks, A., Fawcett, A., Axelsson, M., Rowell, H., Allen, S., Ludgate, C., Humphrey, O., Baker, A. & Copley, V. (2022). Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications. Natural England. Version 1.1. 79 pp.

[3] NatureScot (2023) Guidance Note 7: Guidance to support Offshore Wind Applications: Marine Ornithology - Advice for assessing collision risk of marine birds

[4] Welcker, J. & Vilela, R. 2020. Forecasting regional and local bird migration and cumulative bird strike risk at offshore wind turbines (translated from German). Final Report. BioConsult SH, Husum. 128 pp

[5] Agreement On The Conservation Of African-Eurasian Migratory Waterbirds Conservation Status Report 8

Vantage point surveys:

Further offshore vantage point surveys (cable corridor) were conducted bi-monthly from October 2023 to March 2025 from a single fixed Vantage Point (VP) at Dunany Point. This VP consisted of a 2 km viewshed (with a 180° viewing arc) covering an area of the offshore cable corridor located between the landfall location and the Offshore Ornithology Study Area / Boat-based and Aeriel Survey Area defined in chapter 11: Offshore Ornithology (EIAR volume 2B). The survey results indicated a low passage of brent geese, with a peak count of 310 individuals in January 2024. These observations are reported in volume 2C Addendum, appendix 19-1 Addendum: Onshore Biodiversity — Supporting Information.

11.6.3 Identification of designated sites

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.7 Baseline environment

11.7.1 Designated sites

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.7.2 Species recorded in the Offshore Ornithology Study Area

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.7.3 Important Ecological Features

Reference populations

In response to RFI 7.A, C, D & I the Applicant has provided the following clarifications regarding the method applied.

The populations used within the assessment are detailed in section 11.7.3 of chapter 11: Offshore Ornithology (EIAR volume 2B), subheading ‘Reference Populations’. Although the national breeding population is presented in Table 11-11 of the same chapter, the breeding population within the mean maximum foraging range plus one Standard Deviation (SD) is not listed there but is provided within each impact assessment in section 11.10 (Assessment of Significance) of chapter 11: Offshore Ornithology. All breeding sites from the Seabird Monitoring Programme Database (SMP, 2022) located within the mean maximum foraging range plus one SD of the Project are included to generate the breeding population estimates.

This method of estimating breeding population size, recommended by NatureScot in their guidance documents (Guidance Notes 3, 4, and 5) on assessing impacts on birds (NatureScot, 2023), was recently applied in the newly consented Mona and Morgan projects in the eastern Irish Sea. It represents the most robust and precautionary approach to generating breeding population estimates.

The Applicant can confirm that magnitude of impact presented in section 11.10 is given in context of the breeding population and non-breeding populations, including juveniles/immatures birds. As stated in section 11.10, the proportion of juveniles to adult birds was taken from Horswill and Robinson (2015). In the non-breeding season, the Biologically Defined Minimum Population Scales (BDMPS) populations from Furness (2015) were used, which accounts for individuals of all ages.

For example, the breeding population of gannet within the mean maximum foraging range plus one SD (509.4 km) of the offshore wind farm area was estimated to be 150,897 breeding adults (SMP, 2022 and Burnell et al., 2023). Within this population during the breeding season, there are immature birds as well as adults. Horswill and Robinson (2015) estimated that for every adult there is 0.761 juveniles in the breeding season population, therefore the breeding season population within the mean maximum foraging range of the Project is 265,730 birds. Similar information is presented for each species assessed during the breeding season and is summarised in Table 11A-3. The colonies included within each species’ breeding foraging range, together with the associated colony counts, are listed in appendix 11-7: Offshore Ornithology Apportioning Impacts to Individual Colonies (EIAR volume 2B).

Table 11A-3: Breeding foraging range population used for the project alone assessment and the Cumulative Impact Assessment (CIA). Colony counts within foraging range (Woodward et al., 2019) were extracted from the Seabird Monitoring Programme (SMP) online database (available online at: https://app.bto.org/seabirds/public/index.jsp). Proportion of immatures in the breeding population derived from Horswill and Robinson (2015) are also presented.

Species	Mean maximum foraging range plus one SD (adults only)	Proportion of immatures in the breeding population (derived from Horswill and Robinson, 2015)	Mean maximum foraging range plus one SD (adults and immatures) for the project alone assessment	CIA population (largest BDMPS population (adults and immatures)
Arctic tern	N/A	N/A	N/A	N/A
Black guillemot	N/A	N/A	N/A	N/A
Black-headed gull	N/A	N/A	N/A	N/A
Common gull	N/A	N/A	N/A	734,567
Common scoter	N/A	N/A	N/A	N/A
Common tern	N/A	N/A	N/A	N/A
Cormorant	N/A	N/A	N/A	N/A
Fulmar	N/A	N/A	N/A	N/A
Gannet	150,897	0.761	265,730	N/A
Great black-backed gull	1,192	1.538	3,025	53,181
Great northern diver	N/A	N/A	N/A	N/A
Great skua	N/A	N/A	N/A	N/A
Guillemot	351,632	0.916	673,727	1,567,398
Herring gull	9,666	1.37	22,908	196,791
Kittiwake	78,274	0.898	148,564	928,207
Lesser black-backed gull	N/A	N/A	N/A	N/A
Manx shearwater	1,289,394	0.840	2,372,485	N/A
Puffin	N/A	N/A	N/A	N/A
Razorbill	55,886	0.876	104,842	606,914
Red-breasted merganser	N/A	N/A	N/A	N/A
Red-throated diver	N/A	N/A	N/A	N/A
Roseate tern	N/A	N/A	N/A	N/A
Sandwich tern	N/A	N/A	N/A	N/A
Shag	N/	N/A	N/A	N/A

For the cumulative impact assessment, the Applicant has used the largest population estimates from Furness (2015), as detailed in Table 11-11 and section 11.11 of the chapter, except for the common gull. In this case, an aggregated winter population estimate for the UK and Ireland as presented in section 11.11 of the chapter.

As set out in the Department of Communications, Climate Action and Environment (DCCAE) Guidance (2018) EIAs are undertaken following extensive baseline characterisation surveys. The use of additional, non site-specific data sources can support a description of the general environment but should not be used as part of the baseline characterisation for an assessment. Site-specific baseline survey data collected to date have been undertaken at a spatial/temporal resolution that ensures the data and its validity are sufficiently robust and sound for undertaking an assessment.

Data collected for any other purpose are at a spatial/temporal resolution which is not appropriate for undertaking a project specific assessment (e.g. ObSERVE I and II) as they do not cover the impacted area in a high enough resolution. The baseline surveys for the Project were undertaken over a period of 19 months for the of baseline boat surveys (carried out between May 2018 and May 2020) and 6 months of aerial digital surveys (carried out between April 2020 and September 2020) to capture the relative assemblage of species which are likely to be impacted by the Project.

Following the baseline characterisation an assessment has been undertaken using the advice from the DCCAE (2018) Guidance and using multiple methods to assess any direct or indirect impact on specific species, sites and habitats. It is standard scientific practice to not assess species which are not susceptible to an impact either by occurring in low numbers or having low sensitivity to an impact. This reduces complexity within the assessment process and allows the focus to be on the key areas/receptors of concern as set out in guidance (Natural England, 2022a, b and c; SNCB, 2022; NatureScot, 2023). Some species are not as readily detected from boat-based or aerial surveys due to their biological characteristic (colour, size etc) and daily activity timing (nocturnal vs diurnal) (e.g. small species such as European storm petrel are easier to detect from boat-based than aerial surveys), however the Project utilised both these techniques to minimise such gaps. The Applicant is confident that the suite of surveys employed allows the baseline to be appropriately characterised.

When determining which species to assess in the EIAR for each impact (disturbance and displacement, and collision), the Applicant applied a screening process based on species abundance recorded during the site-specific surveys and their sensitivity to effects. Specifically, the Applicant considered species abundance within both the overall study area and the offshore wind farm area (array area) plus an appropriate buffer of 2–4 km (as shown in Table 11-9 of chapter 11: Offshore Ornithology), and species sensitivity to disturbance & displacement, and collision impacts.

The abundance data presented are derived from the sum of all records collected during the site-specific surveys. Abundance levels were categorised as follows: very low (< 49 individuals), low (50 to 199), moderate (200 to 999), high (1,000 to 4,999), and very high (> 5,000).

The Applicant considers that, where the combined total of all raw counts recorded during the 24 baseline surveys is fewer than 49 birds (i.e. very low abundance), any changes are unlikely to be measurable due to the very low magnitude of the predicted impact. Consequently, such species were screened out of the assessment. Furthermore, the baseline surveys were undertaken over a large spatial scale which is not the same as the potential area of impact (e.g. the offshore wind farm area plus appropriate buffer of 2-4 km). Therefore, using the combined total of all raw counts is overly precautionary. Many of the birds recorded would not be considered within an assessment of impact (through displacement or collisions) as they are not within the affected area.

Accordingly, the following species were excluded from the assessment of effects in the EIAR due to very low abundance in the Offshore Ornithology Study Area:

- Arctic tern: Only a single bird recorded.
- Black-headed gull: Only seven birds recorded.
- Cormorant: Although the species has moderate sensitivity to disturbance and displacement, its very low abundance (47 birds) means that an assessment of disturbance and displacement was unnecessary.
- Fulmar: The species is not considered susceptible to collisions or displacement and is therefore excluded from impact assessment.
- Great skua: Recorded at very low abundance (3 birds).
- Lesser black-backed gull: Recorded in very low abundance (16 birds). Given the very low numbers a collision risk assessment was not required.
- Red-breasted merganser: Recorded in very low abundance (8 birds).

For species present in low abundance (50 to 199) or higher abundance —moderate (200 to 999), high (1,000 to 4,999), and very high (> 5,000)—further screening was conducted based on their sensitivity and abundance within the offshore wind farm area. Accordingly, the following species were excluded:

- Black guillemot: Moderate sensitivity to disturbance & displacement; Very low sensitivity to collision and high abundance (1,115 birds).

- Common tern: Low sensitivity to disturbance and displacement; Moderate sensitivity to collision. Low abundance (55 birds). The peak count on a single survey was 21 birds (recorded in September 2018 and August 2019 during the post-breeding migration). Common tern were observed in nine of the 24 survey months, coinciding with the breeding and post-breeding migration periods. Within the array area, only two birds were recorded during Digital Aerial Surveys (DAS) and five birds across three sightings during boat-based surveys. Given the low number of birds present within the array area, the species was not assessed for collision risk.

- Common scoter: High sensitivity to disturbance & displacement; Low sensitivity to collision; high abundance (2,222 birds). Generally recorded in low numbers in inshore areas with the exception of April 2020 which recorded 2,004 individuals. The birds were however outside the offshore wind farm area or offshore cable corridor and distributed in the north-west corner of the Offshore Ornithology Study (Oriel Offshore: April – September 2020 - Aerial Bird & Marine Megafauna Survey (APEM, 2020). Given the low number of birds within the offshore wind farm area or offshore cable corridor, the species was not assessed for collision risk.

- Manx shearwater: Very low sensitivity to disturbance & displacement; Very low sensitivity to collision; high abundance (8,043 birds). Whilst Manx shearwater were observed in very high abundance during the site-specific surveys, they were excluded from the collision risk assessment. This decision was based on findings by Wade et al. (2016), who evaluated the vulnerability of various seabird species to collision risks, particularly in the context of offshore wind developments and other anthropogenic structures. In their study, Manx shearwater was identified as the least vulnerable seabird species to collision impacts. This lower vulnerability rating is likely due to their specific flight behaviours, flight altitudes, and avoidance capabilities, which reduce their likelihood of colliding with man-made structures. The apparently spends limited time flying at rotor blade height (i.e. usually flies less than 20 m above sea level; Garthe and Hüppop, 2004, King et al., 2009, Cook et al., 2012, Furness and Wade, 2012, Furness et al., 2013, Bradbury et al., 2014, Certain et al., 2015). Although this species was excluded from the collision risk assessment, it has been included into the displacement and disturbance assessment presented in section 11.10.1 of this Addendum as requested (see response to RFI 7.E in Table 11A-1).

- Puffin: Low sensitivity to disturbance & displacement; Very low sensitivity to collision. Low abundance (68 birds). The peak count on one survey was 24 birds (in September 2020 during the post-breeding migration). Puffin were recorded in 12 of the 24 months of surveys, which coincided with the breeding period and post-breeding migration. There were only two birds recorded within the array area during DAS (across two sightings) and five birds (across four sightings) during boat-based surveys. Puffin are considered susceptible to displacement, alongside the other auk species. Considering the number of birds present within the array area (two to four birds) it was not deemed required to do a displacement assessment to allow a conclusion to be drawn.

In response to RFI 7.D, the Applicant has provided below further justification for screening in species with respect to disturbance and displacement assessment. Full justification is provided within Table 11-21 and 11-22 and associated text at the end of section 11.10.1 of chapter 11: Offshore Ornithology (EIAR volume 2B).

As stated, only species recorded in moderate or higher abundances within the offshore wind farm area, and with a sensitivity rating of moderate or above, were screened in and taken forward for assessment of displacement and disturbance.

For example, herring gull (and all gull species) has a low sensitivity to displacement as noted within these peer reviewed studies (Furness *et al*, 2012; Bradbury *et al*, 2014; Dierschke *et al*, 2016; SNCB, 2022; NatureScot, 2023), with bird distribution not effected by the placement of turbines. Therefore, this species was not included within the assessment of impact as there is no evidence than an effect occurs.

When a species was recorded in low numbers but has moderate sensitivity to the impact (e.g. Sandwich tern), it was not assessed. Displacement affects only a portion of those present—typically ranging between 30% and 70%—so not all birds are displaced. Due to the low abundance recorded during the site-specific surveys for some species, any change would be neither measurable nor detectable at the population level. Consequently, when only a small number of birds are present, an even smaller number would be affected, and the Project would not significantly impact the population. Accordingly, species with low and very low abundance have been excluded from the displacement assessment, in line with the best practice guidance outlined herein. Furthermore, other available data sources, including ObSERVE surveys, were reviewed when determining which species to screen in or out, ensuring a comprehensive and well-informed selection process.

It is standard scientific practice to focus on the key areas/receptors of concern as set out in guidance e.g. Displacement advice note prepared by the Marine Industry Group for ornithology (MIG-Birds), with contributions from Joint Nature Conservation Committee, Natural England, Natural Resources Wales, Northern Ireland Environment Agency and Scottish Natural Heritage (SNCB, 2022) and exclude species which are not susceptible to an impact. The Statutory Nature Conservation Bodies (SNCBs) referenced in this report include the Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resources Wales (NRW), NatureScot, the Northern Ireland Environment Agency (NIEA), and the Council for Nature Conservation and the Countryside (CNCC), each responsible for implementing conservation within its respective jurisdiction.

Table 11A-4: Screening used in the EIAR for determining species inclusion or exclusion in the assessment.

Species	Abundance in Study Area	Abundance in Offshore Wind Farm Area & Cable Corridor	Sensitivity to Disturbance & Displacement	Screened in/out disturbance and displacement	Sensitivity to collision	Screened in/out collision
Arctic tern	Very low (1)	Very low	Low	Out	Low	Out
Black-headed gull	Very low (7)	Very low	Low	Out	Moderate	Out
Black guillemot	High (1,115)	Low	Moderate	Out	Very low	Out
Common gull	Moderate (323)	Low	Low	Out	High	In
Common scoter	High (2,222)	Low	High	Out	Low	Out
Common tern	Low (55)	Very low	Low	Out	Moderate	Out
Cormorant	Very low (47)	Very low	Moderate	Out	Low	Out
Fulmar	Very low (43)	[6]Very Low	Very low	Out	Very low	Out
Gannet	High (1,216)	High	Very low	In (due to post-construction sensitivity)	High	In
Great black-backed gull	Moderate (414)	Low	Low	Out	Very high	In
Great northern diver	Moderate (837)	Moderate	High	In	Low	Out
Great skua	Very low (3)	Very low	Very low	Out	Moderate	Out
Guillemot	Very high (23,878)	Very high	Moderate	In	Very low	Out
Herring gull	Moderate (359)	Low	Very low	Out	Very high	In
Kittiwake	Moderate (742)	Moderate	Very low	Out	High	In
Lesser black-backed gull	Very low (16)	[6]Very Low	Very low	Out	Very high	Out
Manx shearwater	Very high (8,043)	Very high	Very low	Out	Very low	Out
Puffin	Low (68)	Low	Low	Out	Very low	Out
Razorbill	High (2,955)	Very high	Moderate	In	Very low	Out
Red-breasted merganser	Very low (8)	Very low	Moderate	Out	Low	Out

11.7.4 Future baseline scenario

In response to RFI 7.B (Table 11A-1), the Applicant was requested to provide 'justification that the original digital area surveys and boat-based data remain relevant and appropriate at the point of submitting additional information to support the proposed development'. There was a large-scale outbreak of HPAI in winter 2021/22 in wetland birds (geese, swans and ducks predominately), which then moved to seabirds in the summer of 2022. This was acknowledged in section 11.7.4 (future baseline scenario) of chapter 11: Offshore Ornithology (see EIAR volume 2B) which stated that all of the survey data and population estimates presented within the EIAR preceded HPAI.

The Applicant acknowledged the unknown short, medium and long-term effects of the 2022 HPAI outbreak as a data limitation within section 11.7.4 (future baseline scenario) of chapter 11: Offshore Ornithology. There is no agreed industry wide guidance on how HPAI should be considered within assessment or interpretation of results from baseline characterisation surveys. This concern is industry wide is not solely in relation to the Project. Therefore, the Applicant has considered the impact of HPAI as far as possible and in accordance with the Natural England's advice note. Natural England is the only Statutory Nature Conservation Body (SNCB) which has published guidance on how to consider HPAI, which in summary concludes that the impact would be proportionally changed (Natural England, 2024).

---

[6] Fulmar and Lesser black-backed gull was incorrectly assigned 'low' under 'abundance in offshore wind farm area and offshore cable corridor' in Table 11-21 in chapter 11: Offshore Ornithology (EIAR volume 2A).

Given that the Project presented baseline survey data from 2018-2020 and colony counts from 2015-2021 to define the breeding populations (see chapter 11: Offshore Ornithology, volume 2B) all of the impacts presented are likely to be higher than those post HPAI.

Given the potential population declines at colonies following an HPAI outbreak, the number of birds recorded in the baseline surveys would decrease proportionally across the populations. Since the resulting impact is presented as a percentage change in baseline mortality, the relative impact remains unchanged. Therefore, the baseline data continue to be relevant and appropriate for informing the assessment presented in chapter 11: Offshore Ornithology and this Addendum.

Over the past few years, numerous scientific papers have been published on the potential impact of Highly Pathogenic Avian Influenza (HPAI) on various seabird populations. For instance, entire issues of the scientific journal Bird Study (Volumes 71, Issue 4, and Volume 72, Issue 1) have been dedicated to HPAI and seabird species. Research has shown that when a high level of mortality occurs at a specific colony, subsequent years often exhibit above-average productivity due to reduced competition (e.g., Burke et al., 2023; Harris et al., 2024).

11.7.5 Data validity and limitations

The data limitations and assumptions are detailed in section 11.7.5 of chapter 11: Offshore Ornithology. This section highlights several limitations in data collection of site-specific surveys and subsequent analyses, all of which have been considered in the impact assessment.

A comprehensive assessment of survey-data validity was undertaken during preparation of this EIAR addendum to confirm the robustness of the baseline site-specific surveys. The technical report has been prepared to compare seabird densities recorded during the Oriel Wind Farm Project's digital aerial surveys (DAS) in 2020 with those from the Clogherhead Wind Farm Project's DAS conducted in 2021 and 2022. Both survey campaigns covered an overlapping area, providing a direct basis for comparison. The report found that when comparing the Project DAS and Clogherhead DAS data within the Study Area there is a clear pattern that Oriel DAS recorded a greater density of birds, when looking at both the average and maximum density per month. The report is presented in appendix 11-8: Aerial Survey Data Comparison (EIAR volume 2B Addendum). Therefore, the Applicant confirms that the site-specific surveys used in this assessment remain valid and robust for evaluating the impacts.

The Applicant acknowledges the concerns raised regarding the data validity and limitations. However, the baseline site characterisation is based on over two years' of data collection and is therefore considered to be sufficiently robust to undertake an impact assessment in line with NatureScot (2023) guidance, Natural England (2022) and DCCAE (2018). The Applicant remains committed to ongoing engagement with relevant stakeholders and to monitoring emerging literature, incorporating new data as it becomes available.

11.8 Key parameters for assessment

No changes to EIAR chapter 11: Offshore Ornithology.

11.8.1 Project design parameters

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.8.2 Measures included in the Project

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.8.3 Impacts scoped out of the assessment

In response to RFI 7.W, the Applicant has provided additional rationale for the screening out of passerines from the offshore ornithology assessment. When undertaking impact assessments for offshore wind farms emphasis must be placed on impacts which have the potential to have measurable impacts on the populations that are affected. There is a theoretical risk to migrating passerines, but an inability to assess how this impacts the population due to a lack of data on numbers of birds at breeding and wintering areas. There is an unknown number of birds which choose to cross the Irish Sea in autumn and spring, each time in a single flight. Therefore, there is no meaningful way to assess an impact with a large degree of confidence. The key considerations for scoping out impact on passerines are as follows:

- Passerines migrate at heights which are far higher than the proposed turbines (Welcker, 2019; Welcker & Vilela, 2019; Woodward *et al*., 2022);
- Passerines moving across the Irish Sea can undertake the sea crossing over a large front i.e. the entire length of both Ireland and Britain;
- Inability to identify species with radar analysis that results in a meaningless assessment of the species as part of the assessment, as all 'passerines' would be amalgamated, therefore assessing many millions of birds;
- Passerines fly at fast speeds when migrating (Welcker, 2019) and are small, which means mathematically there is a low probability of collisions occurring even if they were within collision risk heights;
- Finally, the Project covers a tiny portion of the potential migration route which passerine species could take, therefore the probability to collisions is insignificant at a population level.

The Applicant acknowledges that the potential cumulative effects of collisions involving migratory passerine birds have not been considered in the assessment during application. Collision risk to migratory passerines were scoped out during all phases of the Project as the risk was considered negligible (Table 11-15 in chapter 11: Offshore Ornithology).

11.9 Impact assessment methodology

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.9.1 Overview

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.9.2 Impact assessment criteria

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.9.3 Identification of designated sites

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.10 Assessment of significance

11.10.1 Disturbance and displacement

This section of the Addendum provides additional information to that presented in chapter 11, including the following:

- A new assessment of the impact of disturbance and displacement on the red-throated diver during both the construction, decommissioning and operational phases of the project (In response to comment 7.L).

- A new assessment of the impact of disturbance and displacement on the kittiwake during the operational phase (In response to comment 7.M).

- Consideration of maximum displacement and mortality rates (10%) for the following species: great northern diver (construction, decommissioning and operation phases), red-throated diver (construction, decommissioning and operational phases), gannet (operation phase), guillemot (construction, decommissioning and operational phases), and razorbill (construction, commissioning and operational phases) (In response to comment 7.F).

- A new assessment of the impact of disturbance and displacement on Manx shearwater during the operational phase (In response to comment 7.F).

Construction phase

Red-throated diver

Magnitude of impact – non-breeding bio-season (September – May)

Birds recorded in the autumn and spring migration seasons are likely to remain in a location for a shorter period of time as they are on the move and will be less sensitive to displacement as a result. However, the assessment takes a precautionary approach and considers displacement in the context of the peak number of birds recorded during the entire non-breeding bio-season defined as September-May, which includes the autumn and spring migration periods.

A mean-peak density of 0.06 birds/km^2 was estimated in the offshore wind farm area during the non-breeding bio-season (September – May) during the boat-based survey. The peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 0.09 birds/km^2 (during the April 2020 survey) (Table 31 of in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results (EIAR volume 2B)).

Based on a peak density of 0.09 birds/km^2 (April – September 2020) within the offshore wind farm area and a disturbance distance of up to 50.27 km^2 (using a radial displacement of 4 km around a single point of displacement) there could be approximately five birds at risk of temporary displacement during one or two non-breeding seasons during which construction would occur.

Based on a disturbance distance of up to 314.16 km^2 (using a radial displacement of 10km around a single point of displacement), there could be approximately 28 birds at risk of temporary displacement during one or two non-breeding seasons during which construction would occur.

Due to the temporary nature of construction, a displacement rate of 100% and a mortality rate 1% is considered realistic. Therefore, the additional mortality of up to 0.05 birds may occur (using a 4 km buffer) and 0.28 (using 10 km buffer).

Using the upper range of mortality effects for displaced individuals (up to 10% mortality) combined with a 100% displacement rate would result in an additional mortality of up to 0.50 birds within a 4 km buffer and 2.8 birds within a 10 km buffer. However, this scenario is not considered ecologically realistic, as there is no evidence to support a 10% mortality rate for displacement of birds.

The impact of disturbance and displacement caused by construction activities during the non-breeding season is predicted to be of local spatial extent, short term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with up to up 0.05 birds estimated to be at risk of mortality during the breeding season (based on a 100% displacement rate and a 1% mortality rate), this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of red-throated diver

Divers are generally regarded as being highly sensitive to disturbance and displacement, showing a very high flush distance (i.e. the linear distance from an observer vessel to the birds at the moment of take-off from the water) and are likely to avoid disturbed areas (Garthe *et al*., 1994; Furness *et al*., 2012; and Bradbury *et al*, 2014; Thompson *et al*., 2023).

Red-throated divers are deemed to be of low vulnerability, low recoverability and high conservation value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect – non-breeding bio-season (September – May)

Overall, the magnitude of the impact is deemed to be negligible, and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

Great Northern Diver

Magnitude of impact – non-breeding season

A mean-peak density of 1.59 birds/km^2 was estimated in the offshore wind farm area during the non-breeding bio-season (September – May) during the boat-based surveys. The mean-peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 2.42 birds/km^2 (Table 32 of in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results (EIAR volume 2B)).

Based on a mean-peak density of 2.42 birds/km^2 within the Offshore Ornithology Study Area during the DAS and a disturbance distance of 50.27 km^2 (using a radial displacement around a single point of displacement of 4km) there would be approximately 122 birds at risk of temporary displacement during one or two non-breeding seasons during which construction would occur. Great northern diver are sensitive to disturbance and can be displaced from 4 km away from the development (Bradbury *et al*., 2014; SNCB, 2022). There is no evidence that great northern diver are being displaced beyond 4 km from the offshore wind farm (SNCB, 2022).

A worst-case approach is taken to the assessment, which assumes 100 % displacement from the potential zone of influence within 4 km of the source of construction disturbance.

A value of 0.5 % mortality has been used in assessing the number of individuals that could be at risk of mortality due to disturbance and displacement during the construction phase, reflecting the absence of constraint to specific locations by non-breeding birds (SNCB, 2022). Topping and Petersen (2011) found no evidence for population effect in the related species, red-throated diver as a result of displacement from offshore wind farms. Furthermore, great northern diver may have a stronger tolerance to disturbance compared to other diver species (e.g. red-throated and black-throated) (Gittings *et al*., 2015), although the literature on this subject is sparse. Based on a 100% displacement rate and a 0.5% mortality rate, the offshore wind farm construction would result in additional annual mortality of 0.61 birds within a 4 km buffer.

Additionally, a 10% mortality rate has been presented to provide the maximum range of mortality rate in the estimates of predicted mortalities, in response to comment 7.E. Based on a 100% displacement rate and 10% mortality rate, the offshore wind farm construction would result in additional mortality of 12.2 birds annually. A 10% mortality rate has been included to provide the maximum range of mortality rate in the estimates of predicted mortalities, given the location of the site partially within the North-west Irish Sea SPA. However, this scenario is not considered ecologically realistic, as there is no evidence to support such high mortality rate. Therefore, the 10% mortality rate scenario should be treated as excessively precautionary rather than a plausible outcome.

The impact of disturbance and displacement caused by construction activities and associated vessel movements during the non-breeding season is predicted to be of local spatial extent, short term duration, and reversible. It is predicted that the impact will affect the receptor directly, however any increases in mortality associated with construction activities are unlikely to significantly affect the population. The magnitude is therefore considered to be negligible.

Sensitivity of great northern divers

Divers are generally regarded as being highly sensitive to disturbance and displacement, showing a very high flush distance (i.e. the linear distance from an observer vessel to the birds at the moment of take-off from the water) and are likely to avoid disturbed areas (Garthe et al., 1994; Furness et al., 2012; and Bradbury et al., 2014). Furthermore, the guidance for undertaking ESAS surveys refer to the need to scan the sea area ahead of the ship “to detect the take-off of usually very wary seaduck and divers well ahead of the approaching platform” (Camphuysen et al., 2004 and Gittings et al., 2015). In order to quantify the responses of great northern divers to increased marine traffic, Gittings et al. (2015) undertook a study on the great northern diver population in Inner Galway Bay. The study indicated that great northern divers in the area around the existing harbour did not show any significant response to normal ship and boat traffic, however they do exhibit a flush response when driven at directly in a rigid inflatable boat at speeds of 20 to 30 knots (Gittings et al., 2015). The study conflicted with the general perception about disturbance sensitivity in diver species and remained inconclusive. Due to the Project’s connectivity with nearby designated SPA sites, great northern diver are considered to have an international (high) conservation value as those individuals present within the offshore wind farm area are likely to form part of the wintering population of the nearby SPA populations (see Table 11-8). Assuming an unlikely worst-case scenario of total displacement and 1% resulting mortality, great northern divers are deemed to be of high vulnerability and high conservation value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect – non-breeding season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of great northern diver is considered to be high. The effect will therefore be of **slight adverse significance**, which is not significant in EIA terms

Guillemot

Magnitude of impact – all seasons

A mean-peak density of 10.3 birds/km^2 was estimated in the offshore wind farm area during the breeding bio-season (April to July) during the boat-based surveys. The mean-peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 21.4 birds/km^2 (Table 25 in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results (EIAR volume 2B)).

During the breeding season, based on a mean-peak density of 10.3 to 21.4 birds/km^2 within an area of 12.56 km^2 (radial displacement around a single point of displacement). There would be approximately 129 to 269 birds at risk of temporary disturbance and displacement during one or two breeding seasons during which construction would occur.

A mean-peak density of 30.5 birds/km^2 was estimated in the offshore wind farm area during the non-breeding bio-season (September to March) during the boat-based surveys. The mean-peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 61.9 birds/km^2 (Table 25 in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results (EIAR volume 2B).

During the non-breeding season, based on a mean-peak density of 30.5 to 61.9 birds/km2 within an area of 12.56 km^2 (radial displacement around a single point of displacement). There would be approximately 383 to 777 birds at risk of temporary disturbance and displacement during one or two non-breeding seasons during which construction would occur.

Following the guidance presented by the SNCB (2022), the recommended displacement rate for auk species is between 30% and 70%, while advice provided by NatureScot recommends a displacement rate of 60 % and a mortality rate of 1% (from Marine Scotland Scoping opinion for Seagreen development in the Firth of Forth).

For the purposes of this assessment and considering the temporary and intermittent nature of the construction disturbance, the impact is assessed in the context of 50% displacement rate and 1% mortality rate.

However, the maximum impact has also been included in the context of a 70% displacement rate and 10% mortality rate, given the location of the site partially within the North-west Irish Sea SPA and proximity to colonies, Lambay Island SPA & Irelands Eye SPA. It is important to consider that drawing conclusions based solely on the maximum range of displacement rates is over-precautionary and not ecologically realistic.

Based on 50% displacement rate and 1% mortality rate, the construction of the offshore wind farm and offshore cable would result in additional mortality of:

- Breeding season: 0.65 to 1.34 birds; and
- Non-breeding season: 1.92 to 3.89 birds[7]

Based on the 70% displacement rate and 10% mortality rate, the construction of the offshore wind farm and offshore cable would result in additional mortality of:

- Breeding season: 9.0 to 18.8 birds; and

[7] The figures for guillemot were incorrectly quoted in section 11.10.1 ‘Disturbance and displacement’ in chapter 11: Offshore Ornithology (EIAR volume 2B).

- Non-breeding season: 26.8 to 54.4 birds

The non-breeding (August – February) regional BDMPS (Irish Sea) for guillemot was estimated to be 1,567,398 individuals. Using the average baseline mortality rate for guillemot (all age class mortality rate of 0.198; see Table 11-12), the baseline mortality during the non-breeding season is 310,345 birds. Based on 50% displacement rate and 1% mortality rate, the additional mortality of 3.89 individuals[8] represents a 0.001 % increase in baseline mortality and would therefore be undetectable at a population level. The impact of disturbance and displacement caused by construction activities and associated vessel movements over 15 months (including one or two breeding and non-breeding seasons) is predicted to be of local spatial extent, short term duration and reversible. It is predicted that the impact will affect the receptor directly, however any increases in mortality associated with construction activities are negligible.

The worst-case scenario, assuming a 70% displacement rate and a 10% mortality rate, is also presented, although there is no evidence to support such a high mortality rate. The additional mortality of 54.4 individuals represents only a 0.01% increase over the baseline mortality and would therefore be undetectable at the population level.

Razorbill

Magnitude of impact – all seasons

A mean-peak density of 0.25 birds/km^2 was estimated in the offshore wind farm area during the breeding bio-season (April to July) during the boat-based surveys. The mean-peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 5.6 birds/km^2 (Table 26 included in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results, volume 2B).

During the breeding period, based on a mean-peak density of 0.25 to 5.6 birds/km^2 within an area of 12.56 km^2. There would be approximately 3 to 70 birds at risk of temporary disturbance and displacement during one or two breeding seasons during which construction would occur.

A mean-peak density of 9.6 birds/km^2 was estimated in the offshore wind farm area during the non-breeding bio-season (September to March) during the boat-based surveys. The mean-peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 10.5 birds/km^2 (Table 26 included in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results, volume 2B).

During the non-breeding period, based on a mean-peak density of 9.6 to 10.5 birds/km^2 within an area of 12.56 km^2. There would be approximately 121 to 132 birds at risk of temporary disturbance and displacement during one or two non-breeding seasons during which construction would occur.

Following the guidance presented by the SNCB (2022), the recommended displacement rate for auk species is between 30% and 70% and mortality between 1 and 10%, while advice provided by NatureScot recommends a displacement rate of 60% and a mortality rate of 1% (from Marine Scotland Scoping opinion for Seagreen development in the Firth of Forth). For the purposes of this assessment and considering the temporary and intermittent nature of the construction disturbance, the impact is assessed in the context of 50% displacement rate and 1% mortality rate. However, the maximum impact has also been included in the context of a 70% displacement rate and 10% mortality rate, given the location of the site partially within the North-west Irish Sea SPA and proximity to colonies, Lambay Island SPA & Irelands Eye SPA. It is important to consider that drawing conclusions based solely on the maximum range of displacement rates is over-precautionary and not ecologically realistic.

Based on the 50% displacement rate and 1% mortality rate, the construction of the offshore wind farm and offshore cable would result in additional mortality of:

- Breeding season: 0.2 to 3.5 birds; and

[8] The Applicant acknowledges an erratum in chapter 11: offshore Ornithology (EIAR volume 2B), where the increase on yearly mortality of Guillemot was recorded as 38.9, where the correct rate, as shown above, is 3.89 individuals per year. This does not effect the final assessment included in chapter 11: Offshore Ornithology (EIAR volume 2B)

- Non-breeding season: 6.0 to 6.6 birds

Based on the 70% displacement rate and 10% mortality rate, the construction of the offshore wind farm and offshore cable would result in additional mortality of:

- Breeding season: 0.2 to 4.9 birds; and
- Non-breeding season: 8.5 to 9.2 birds

The winter season regional BDMPS (Irish Sea) for razorbill was estimated to be 341,422 individuals. Using the average baseline mortality rate for razorbill (all age class mortality rate of 0.129; see Table 11-12), the baseline mortality during the winter period is 44,043 birds. Based on a 50% and 1% mortality rate, the addition of between 6.0 and 6.6 individuals during the non-breeding represents an 0.01 % increase in baseline mortality and would therefore be undetectable at a population level.

The worst-case scenario, assuming a 70% displacement rate and a 10% mortality rate, is also presented, although there is no evidence to support such a high mortality rate. The additional mortality of 9.2 individuals represents only a 0.02% increase over the baseline mortality and would therefore be undetectable at the population level.

The impact of disturbance and displacement caused by construction activities and associated vessel movements over 15 months (including one or two breeding and non-breeding seasons) is predicted to be of local spatial extent, short term duration, and reversible. It is predicted that the impact will affect the receptor directly however any increases in mortality associated with construction activities are negligible.

Decommissioning phase

Magnitude of impact

The effects of decommissioning activities are not expected to be of greater magnitude to those described above arising from construction. Certain activities such as piling would not be required, as the decommissioning phase would involve the removal of the structures and materials originally installed. As this process would require the opposite to construction activities, it is anticipated that the same number and type of vessels and equipment will be required. These activities have already been assessed in the construction section of this assessment and have been deemed to be of low or negligible magnitude. The impact is predicted to be of local spatial extent, short term duration, continuous and high reversibility. It is predicted that the impact will affect the receptors directly. The magnitude is therefore considered to be negligible.

Sensitivity of seabirds

As for the construction phase the receptors are deemed to be of medium to high vulnerability, medium to high recoverability and high value. The sensitivity of the receptors is considered to be medium to high.

Significance of the effect

The magnitude of the impact is considered to be negligible and the sensitivity of the receptor species are considered to range between medium to high. The effect will therefore be of **slight adverse significance**, which is not significant in EIA terms.

Operational and maintenance phase

Gannet

The worst-case scenario for gannet is that displacement will occur at a constant level 2 km from the offshore wind farm area. Following recommended guidance, a displacement rate of 60 – 80 % and a mortality rate of 1 % are applicable (SNCB, 2022). However, the maximum impact of an 80% displacement rate and 10% mortality rate have also been included. It is important to consider that drawing conclusions based solely on the maximum range of displacement and mortality rates is over-precautionary and not ecologically realistic.

Gannet scores low for vulnerability to displacement, however literature suggests that they may exhibit strong macro avoidance (Cook *et al*., 2014, Rehfisch *et al*., 2014 Humphreys *et al*., 2015, Dierschke *et al*., 2016 and Weckler *et al*., 2016), with studies demonstrating between 60 % and 80 % avoidance rates of offshore wind farms. A mortality rate of 1% has been used for the conclusion of this assessment, as gannets are able to utilise a wide range of habitat types and food sources and can travel over large areas away from breeding colonies and during migration periods. However, the worst-case scenario, assuming a 10% mortality rate, is also presented, although there is no evidence to support such a high mortality rate.

The displacement matrices in Table 11-23 to Table 11-26 (EIAR chapter 11: Offshore Ornithology) have been populated with data for gannet during the breeding season (April – August), return migration (December – March) and autumn migration (September – November) bio-seasons based on surveys undertaken between May 2018 and September 2020. The tables present displacement from 0 to 100% at 10% increments and mortality from 0 to 100% at 1% increments 10% and 10% thereafter. Shading has been used to highlight the displacement and mortality ranges described in this section.

Magnitude of impact – breeding season

For the estimate derived from boat-based surveys, using the breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 246 individuals, the estimated number of gannet which could be at risk of mortality from displacement is one to two birds (60 – 80 % displacement, 1% mortality) and 20 birds (80% displacement, 10% mortality) (Table 11-23 of EIAR chapter 11: Offshore Ornithology).

For the estimate derived from aerial digital surveys, using the breeding seasonal peak in the offshore wind farm area plus 2 km buffer of 149 individuals, the estimated number of gannet which could be at risk of mortality from displacement is one bird (60 – 80 % displacement, 1% mortality) and 12 birds (80% displacement, 10% mortality) (Table 11-24 of EIAR chapter 11: Offshore Ornithology).

The breeding population of gannet within mean maximum foraging range plus one SD (509.4 km) of the offshore wind farm area was estimated to be 153,897 breeding adults (SMP, 2022 and Burnell *et al*., 2023). There are both SPA and non-SPA breeding colonies within the mean max foraging range. Within the population present within the impacted area during the breeding season there are immatures in addition to the adults. Horswill and Robinson (2015) estimated that for every adult there is 0.761 juveniles in the breeding season population, therefore the breeding season population within the mean maximum foraging range of the Project is 265,730 birds.

Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.181; see Table 11-12) during the breeding season an estimated 48,097 gannet would die naturally. Using a 60–80% displacement rate and a 1% mortality rate, the additional mortality of one or two birds during the breeding season due to disturbance and displacement is negligible (<0.01% increase in mortality) and would be undetectable at the population level.

The worst-case scenario, assuming an 80% displacement rate and a 10% mortality rate, is also presented, although there is no evidence to support such a high mortality rate. The additional mortality of 20 individuals represents only a 0.04% increase over the baseline mortality and would therefore be undetectable at the population level.

The impact of disturbance and displacement caused by operational and maintenance activities during the breeding season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with between one and two individuals estimated to be at risk of mortality during the breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Magnitude of impact – spring migration

For the boat-based estimate, using the spring migration seasonal mean peak in the offshore wind farm area plus 2 km buffer of 43 individuals, the estimated number of gannet which could be at risk of mortality from displacement is zero birds (60 – 80 % displacement, 1 % mortality) and three birds (80% displacement, 10% mortality) (Table 11-25 of EIAR chapter 11: Offshore Ornithology)

Using the worst-case scenario, assuming an 80% displacement rate and a 10% mortality rate, the additional mortality of three individuals represents less than a 0.01% increase in mortality and would therefore be undetectable at the population level.

The impact of disturbance and displacement caused by operational and maintenance activities during the spring migration period is predicted to be of local spatial extent, long term duration, intermittent and medium reversibility. It is therefore predicted that the impact will affect the receptor both directly and indirectly. However, there is not predicted to be any additional mortality in the population during the spring migration period. The magnitude is therefore considered to be negligible.

Magnitude of impact – autumn migration

For the boat-based estimate, using the autumn migration seasonal peak in the offshore wind farm area plus 2 km buffer of 336 individuals, the estimated number of gannet which could be at risk of mortality from displacement is two to three birds (60 – 80 % displacement, 1 % mortality) and 27 birds (80% displacement, 10% mortality) (Table 11-26 of EIAR chapter 11: Offshore Ornithology).

The autumn migration population of gannet was estimated to be 536,005 individuals (adapted from Furness, 2015). Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.181; see Table 11-12) an estimated 97,017 birds would die naturally. The additional mortality of up three birds as a result of disturbance and displacement is of negligible magnitude (<0.01 % increase in mortality), which would be undetectable in the populations.

The worst-case scenario, assuming an 80% displacement rate and a 10% mortality rate, is also presented, although there is no evidence to support such a high mortality rate. The additional mortality of 27 individuals represents only a 0.03% increase over the baseline mortality and would therefore be undetectable at the population level.

The impact of disturbance and displacement caused by operational and maintenance activities during the autumn migration period is predicted to be of local spatial extent, long term duration, intermittent and medium reversibility. It is therefore predicted that the impact will affect the receptor both directly and indirectly, however the two or three individuals estimated to be at risk of mortality during the autumn migration period would be undetectable at a population level. The magnitude is therefore considered to be negligible.

Great Northern Diver

Guidance presented by the SNCB (2022) recommends that displacement matrices for great northern diver should be presented within the offshore wind farm area and a 4 km buffer, with a displacement rate of 90-100%. A value of 1 % mortality has been used in assessing the number of individuals that could be at risk of mortality as a result of disturbance and displacement during the operational phase, reflecting the absence of constraint to specific locations by non-breeding birds and that Topping and Petersen (2011) found no evidence for population effect in the related species, red-throated diver. Furthermore, great northern diver may have a stronger tolerance to disturbance compared to other diver species (e.g. red-throated and black-throated) (Gittings *et al*., 2015), although the literature on this subject is sparse. Additionally, a 10% mortality rate has been presented to provide the maximum range of mortality rate in the estimates of predicted mortalities, in response to comment 7.E.

A mean-peak density of 1.59 birds/km^2 was estimated in the offshore wind farm area during the non-breeding bio-season (September – May) during the boat-based surveys. The mean-peak density of birds within the Offshore Ornithology Study Area during DAS was higher with 2.42 birds/km^2 (Table 32 in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results (EIAR volume 2B).

Magnitude of impact – non-breeding season

Using the estimated bird density of 2.42 birds per square kilometre within the Offshore Ornithology Study Area during DAS, the total number of birds within the offshore wind farm area plus a 4 km buffer zone (covering 157.81 km^2) is estimated to be 382. This results in estimated additional mortality in the non-breeding population of three to four birds (90 - 100 % displacement, 1 % mortality) (Table 11A-5).

Table 11A-5: Aerial digital displacement matrix presenting the peak number of great northern diver in the offshore wind farm area plus 4 km buffer, during the non-breeding season.

Displacement (%)	Mortality rates (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	2	4	8	11	15	19	23	27	31	34	38
20	1	2	2	4	8	15	23	31	38	46	53	61	69	76
30	1	2	3	6	11	23	34	46	57	69	80	92	103	115
40	2	3	5	8	15	31	46	61	76	92	107	122	138	153
50	2	4	6	10	19	38	57	76	96	115	134	153	172	191
60	2	5	7	11	23	46	69	92	115	138	160	183	206	229
70	3	5	8	13	27	53	80	107	134	160	187	214	241	267
80	3	6	9	15	31	61	92	122	153	183	214	244	275	306
90	3	7	10	17	34	69	103	138	172	206	241	275	309	344
100	4	8	11	19	38	76	115	153	191	229	267	306	344	382

An 10 % mortality rate has been included to provide the maximum range of mortality rate in the estimates of predicted mortalities. However, this scenario is not considered ecologically realistic, as there is no evidence to support such mortality rate. This results in estimated additional mortality in the non-breeding population of between 34 and 38 birds (90 - 100 % displacement, 10 % mortality) for the offshore wind farm area plus a 4 km buffer (Table 11A-5).

Burke *et al*. (2018) estimated a non-breeding population of 2,128 for Ireland and approximate background mortality at a rate of 0.161 gives a background annual mortality of 343 birds (see Table 11-12 in chapter 11 Offshore Ornithology (EIAR volume 2B).

Using a 1% mortality rate and 100% displacement, the additional mortality of one bird during the non-breeding season within the offshore wind farm area plus a 4 km buffer would increase the annual mortality by 1.17%, based on the DAS density estimate. However, this approach is very highly precautionary, considering that all birds within the area 4 km from the offshore wind farm area are displaced. It is more realistic to consider that there may be high displacement rate in areas closer to the offshore wind farm area with less displacement as distance increases.

Based on a 10% mortality rate a 100% displacement rate, the additional mortality of 38 birds during the non-breeding season within the offshore wind farm area plus a 4 km buffer would increase the annual mortality by 11%, based on the DAS density estimate. A 10 % mortality rate has been included to provide the maximum range of mortality rate in the estimates of predicted mortalities. However, this scenario is not considered ecologically realistic, as there is no evidence to support such high mortality rate.

The impact of disturbance and displacement caused by operational and maintenance activities during the non-breeding season is predicted to be of local spatial extent, long term duration, continuous and medium reversibility and any increases in mortality associated with operational and maintenance activities are unlikely to significantly affect the population. It is predicted that the impact will affect the receptor both directly and indirectly. The magnitude is considered to be low.

Red-throated diver

Magnitude of impact – non-breeding bio-season (September – May)

During the site-specific surveys, the peak estimate of red-throated divers present within the Offshore Study Area plus the 10 km buffer zone was 48 birds. This estimate was based on the peak density of 0.09 birds/km² recorded within the Offshore Ornithology Study Area during the April 2020 survey (Table 31 in appendix 11-2: Ornithological and Marine Megafauna Aerial Survey Results (EIAR volume 2B). Therefore, using a displacement rate between 90% and 100% and a mortality rate of 1%, the additional mortalities are estimated to range from 0.43 to 0.48 birds.

Using the upper range of mortality effects for displaced individuals (up to 10% mortality) combined with a 100% displacement rate would result in an additional mortality of up to 4.80 birds. However, this scenario is not considered ecologically realistic, as there is no evidence to support a 10% mortality rate.

The impact of disturbance and displacement caused by operation and maintenance during the non-breeding season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with up to up 0.48 birds estimated to be at risk of mortality during the breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of red-throated diver

Red-throated divers are deemed to be of low vulnerability, low recoverability and high conservation value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect – non-breeding bio-season (September – May)

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

Guillemot

The worst-case scenario for guillemot is that displacement will occur at a constant level within 2 km of the offshore wind farm area, of which between 30 and 70 % of birds will be displaced, leading to a mortality rate of between 1 and 5 % (JNCC, 2022).

However, the maximum impact, based on a 70% displacement rate and a 10% mortality rate, has been included due to the site's partial location within the North-west Irish Sea SPA and its proximity to colonies at Lambay Island SPA and Ireland's Eye SPA. It is important to recognize that drawing conclusions solely from the maximum collision and displacement rates is overly precautionary and not ecologically realistic.

Several studies, such as those by Peterson et al. (2006) and Dierschke et al. (2006) indicated a level of displacement on guillemot in offshore wind farms that would suggest high sensitivity to disturbance during the operational and maintenance phase of the Project. However, more recent studies undertaken at other offshore wind farm sites have not shown the same level of effect. For example, Dierschke et al. (2016) suggested that auk displacement is only partial and negligible at some sites, and studies undertaken at Dutch wind farms have reported displacement effects of less than 50 % (Leopold et al., 2011). At the Robin Rigg offshore wind farm, located in the Irish Sea, the number of guillemot observed during all three phases of development remained comparable, providing no evidence of guillemot displacement (Vallejo et al., 2017).

The displacement matrices in Table 11-29 to Table 11-32 of EIAR chapter 11: Offshore Ornithology have been populated with data for guillemot during the breeding (March – July) and non-breeding seasons (August – February) for the boat-based and aerial digital surveys. The tables present displacement from 0 to 100% at 10% increments and mortality from 0 to 100% at 1% increments 10% and 10% thereafter. Shading has been used to highlight the displacement and mortality ranges described in this section.

Magnitude of impact – breeding season

For the boat-based estimate, using the breeding seasonal mean peak in the offshore wind farm area and a 2 km buffer of 820 individuals, the estimated number of guillemot which could be at risk of mortality from displacement is between 2 and 29 birds (30 - 70 % displacement, 1 - 5 % mortality) and 57 birds (70% displacement, 10% mortality) (Table 11-29 of EIAR chapter 11: Offshore Ornithology).

For the aerial digital survey estimate, using the breeding seasonal peak in the offshore wind farm area and a 2 km buffer of 1,594 individuals, the estimated number of guillemot which could be at risk of mortality from displacement is between 5 and 56 birds (30 - 70 % displacement, 1 – 5 % mortality) and 112 birds (70% displacement, 10% mortality) (Table 11-30 of EIAR chapter 11: Offshore Ornithology).

The breeding population of guillemot within mean maximum foraging range plus one SD (153.7 km) of the offshore wind farm area was estimated to be 351,632 breeding adults (Cummins et al., 2019, SMP, 2022 and Burnell et al., 2023). There are both SPA and non-SPA breeding colonies within the mean max foraging range. Within the population present within the impacted area during the breeding season there are immatures in addition to the adults. Horswill and Robinson (2015) estimated that for every adult there is 0.916 juveniles in the breeding season population, therefore the breeding season population within the mean maximum foraging range of the Project is 673,727 birds.

Using the published figures provided above and the baseline mortality rate (average mortality rate of 0.198; (see Table 11-12 of EIAR chapter 11: Offshore Ornithology) an estimated 133,398 birds die naturally each year. Using a 70 % displacement and a 5 % mortality, the additional mortality of 56 birds during the breeding season as a result of disturbance and displacement is of negligible magnitude (0.04 % increase in mortality), which would be undetectable in the populations.

Using a 70 % displacement and a 10 % mortality, the additional mortality of 112 birds during the breeding season as a result of disturbance and displacement is of negligible magnitude (0.08 % increase in mortality), which would be undetectable in the populations.

The impact of disturbance and displacement caused by operational and maintenance activities during the breeding season is predicted to be of local spatial extent, long term duration, continuous and medium reversibility. It is predicted that the impact will affect the receptor both directly and indirectly. The magnitude is therefore considered to be negligible.

Magnitude of impact – non-breeding season

For the boat-based estimate, using the non-breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 2,670 individuals, the estimated number of guillemot which could be at risk of mortality from displacement is between 8 and 93 birds (30 - 70 % displacement, 1% mortality) and 187 birds (70% displacement, 10% mortality). (Table 11-31 of EIAR chapter 11: Offshore Ornithology).

For the aerial digital survey estimate, using the breeding seasonal peak in the offshore wind farm area plus 2 km buffer of 4,938 individuals, the estimated number of guillemot which could be at risk of mortality from displacement is between 15 and 173 birds (30 - 70 % displacement, 1 – 5 % mortality) and 346 birds (70% displacement, 10% mortality) (Table 11-32 of EIAR chapter 11: Offshore Ornithology).

The non-breeding (August – February) regional BDMPS (Irish Sea) for guillemot was estimated to be 1,567,398 individuals. Using the average baseline mortality rate for guillemot (all age class mortality rate of 0.198; see Table 11-12 of EIAR chapter 11: Offshore Ornithology), the baseline mortality during the non-breeding season is 310,345 birds. The additional mortality of between eight and 173 individuals represents a 0.06 % increase in baseline mortality and would therefore be undetectable at a population level.

Using a 70 % displacement and a 10 % mortality, the additional mortality of 346 birds during the non-breeding season as a result of disturbance and displacement is of negligible magnitude (0.11 % increase in mortality), which would be undetectable in the populations.

The impact of disturbance and displacement caused by operational and maintenance phase activities during the non-breeding season is predicted to be of local spatial extent, long term duration, continuous and medium reversibility. It is predicted that the impact will affect the receptor both directly and indirectly. The magnitude is therefore considered to be negligible.

Razorbill

The worst-case scenario for razorbill is that displacement will occur at a constant level within 2 km of the offshore wind farm area, of which between 30 and 70 % of birds will be displaced, with a mortality rate of between 1% and 5 % (JNCC, 2012). However, the maximum impact, based on a 70% displacement rate and a 10% mortality rate, has been included due to the site's proximity to colonies at Lambay Island SPA and

Ireland's Eye SPA. It is important to recognize that drawing conclusions solely from the maximum collision and displacement rates is overly precautionary and not ecologically realistic.

As with guillemot, the literature has documented various responses of razorbill to operational offshore wind farms, with some studies showing complete displacement from within the offshore wind farm area (Peterson *et al.*, 2016 and Dierschke *et al.,* 2016), whereas others have shown no evidence of displacement (Vallejo et al., 2017).

The displacement matrices in Table 11-33 to Table 11-38 of EIAR chapter 11: Offshore Ornithology have been populated with data for razorbill during the breeding season (April – July), spring and autumn migration (January – March and August – October) and winter (November – December) periods. The tables present displacement from 0 to 100% at 10 % increments and mortality from 0 to 100% at 1% increments 10% and 10% thereafter. Shading has been used to highlight the displacement and mortality ranges described in this section.

Magnitude of impact – breeding season

For the boat-based estimate, using the breeding seasonal mean peak in the offshore wind farm area and a 2 km buffer of 12 individuals, the estimated number of razorbill which could be at risk of mortality from displacement is between zero birds (30 - 70 % displacement, 1 – 5 % mortality) and one bird (70% displacement, 10% mortality) (Table 11-33 of EIAR chapter 11: Offshore Ornithology).

For the aerial digital survey estimate, using the breeding seasonal peak in the offshore wind farm area and a 2 km buffer of 353 individuals, the estimated number of razorbill which could be at risk of mortality from displacement is between 1 and 12 birds (30 - 70 % displacement, 1 – 5 % mortality) and 25 birds (70% displacement, 10% mortality) (Table 11-34 of EIAR chapter 11: Offshore Ornithology).

The breeding population of razorbill at breeding colonies within mean maximum foraging range plus one SD (164.6 km) of the offshore wind farm area was estimated to be 55,886 breeding adults (Cummins et al., 2019, SMP, 2022 and Burnell et al., 2023). There are both SPA and non-SPA breeding colonies within the mean max foraging range. Within the population present within the impacted area during the breeding season there are immatures in addition to the adults. Horswill and Robinson (2015) estimated that for every adult there is 0.876 juveniles in the breeding season population, therefore the breeding season population within the mean maximum foraging range of the Project is 104,842 birds.

Using the published figures provided above and the baseline mortality rate (average mortality rate of 0.129; see Table 11-12), the mortality during the breeding season is estimated to be 13,525 birds. The additional mortality of 12 birds during the breeding season as a result of disturbance and displacement is a 0.09% increase in baseline mortality, which is considered of negligible magnitude.

Using an 70 % displacement and a 10 % mortality rate, the additional mortality of 25 birds during the non-breeding season as a result of disturbance and displacement is of negligible magnitude (0.18 % increase in mortality), which would be undetectable in the populations.

The impact of disturbance and displacement caused by operational and maintenance activities during the breeding season is predicted to be of local spatial extent, long term duration, continuous and medium reversibility. It is predicted that the impact will affect the receptor both directly and indirectly. The magnitude is therefore considered to be low.

Magnitude of impact – migration seasons

For the boat-based estimate, using the spring migration seasonal peak in the offshore wind farm area and a 2 km buffer of 859 individuals, the estimated number of razorbill which could be at risk of mortality from displacement is between three and 30 birds (30 - 70 % displacement, 1 – 5 % mortality) and 60 birds (70% displacement, 10% mortality) (Table 11-35 of EIAR chapter 11: Offshore Ornithology).

For the boat-based estimate, using the autumn migration seasonal mean peak in the offshore wind farm area and a 2 km buffer of 962 individuals, the estimated number of razorbill which could be at risk of mortality from displacement is between three and 34 birds (30 - 70 % displacement, 1 – 5 % mortality) and 67 birds (70% displacement, 10% mortality) (Table 11-36 of EIAR chapter 11: Offshore Ornithology).

For the aerial digital estimate, using the autumn migration seasonal peak in the offshore wind farm area and a 2 km buffer of 566 individuals, the estimated number of razorbill which could be at risk of mortality from displacement is between two and 20 birds (30 - 70 % displacement, 1 – 5 % mortality) and 40 birds (70% displacement, 10% mortality) (Table 11-37 of EIAR chapter 11: Offshore Ornithology).

The migration seasons regional BDMPS (Irish Sea) for razorbill was estimated to be 606,914 individuals. Using the average baseline mortality rate for razorbill (all age class mortality rate of 0.129; see Table 11-12 of EIAR chapter 11: Offshore Ornithology), the baseline mortality during the spring and autumn migration period is 78,292. The addition of between two and 34 individuals per season represents a 0.04 % increase in mortality and would therefore be undetectable at a population level.

Using an 70 % displacement and a 10 % mortality rate, the additional mortality of 67 birds during the non-breeding season as a result of disturbance and displacement is of negligible magnitude (0.09 % increase in mortality), which would be undetectable in the populations.

The impact of disturbance and displacement caused by operational and maintenance activities during the migration seasons is predicted to be of local spatial extent, long term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor both directly and indirectly. The magnitude is therefore considered to be negligible.

Magnitude of impact – winter season

For the boat-based estimate, using the winter seasonal peak in the offshore wind farm area plus 2 km buffer of 512 individuals, the estimated number of razorbill which could be at risk of mortality from displacement is between two and 18 birds (30 - 70 % displacement, 1 – 5 % mortality) and 41 birds (70% displacement, 10% mortality) (Table 11-38 of EIAR chapter 11: Offshore Ornithology).

The winter season regional BDMPS (Irish Sea) for razorbill was estimated to be 341,422 individuals. Using the average baseline mortality rate for razorbill (all age class mortality rate of 0.129; see Table 11-12), the baseline mortality during the winter period is 44,043 birds. The addition of between two and 18 individuals per season represents a 0.04 % increase in baseline mortality and would therefore be undetectable at a population level.

Using an 70 % displacement and a 10 % mortality rate, the additional mortality of 36 birds during the non-breeding season as a result of disturbance and displacement is of negligible magnitude (0.08 % increase in mortality), which would be undetectable in the populations.

The impact of disturbance and displacement caused by operational and maintenance activities during the migration seasons is predicted to be of local spatial extent, long term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor both directly and indirectly. The magnitude is therefore considered to be negligible

Black-legged kittiwake

In response to RFI 7.M, the Applicant has provided an assessment of the disturbance and displacement of kittiwake during the operational and maintenance phase in line with NatureScot advice (noting that this does not align with the Natural England and Natural Resources Wales advice).

Magnitude of impact – breeding season

For the estimate derived from boat-based surveys, using the breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 74 individuals, the estimated number of kittiwake which could be at risk of mortality from displacement is zero to one bird (30 % displacement, 1-3% mortality) (Table 11A-6).

For the estimate derived from DAS, using the breeding seasonal peak in the offshore wind farm area plus 2 km buffer of 65 individuals, the estimated number of kittiwake which could be at risk of mortality from displacement is zero to one bird (30 % displacement, 1-3% mortality) (Table 11A-7).

Table 11A-6: Boat-based displacement matrix presenting the mean peak number of kittiwake in the offshore wind farm area plus 2 km buffer, during the migration-free breeding bio-season.

Displacement (%)	Mortality rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
10	0	0	0	0	0	0	1	1	2	3	4	4	5	6	7	7
20	0	0	0	0	1	1	1	3	4	6	7	9	10	12	13	15
30	0	0	0	1	1	1	2	4	7	9	11	13	16	18	20	22
40	0	0	1	1	1	1	3	6	9	12	15	18	21	24	27	30
50	0	0	1	1	1	2	4	7	11	15	19	22	26	30	33	37
60	0	0	1	1	2	2	4	9	13	18	22	27	31	36	40	44
70	0	1	1	2	2	3	5	10	16	21	26	31	36	41	47	52
80	0	1	1	2	2	3	6	12	18	24	30	36	41	47	53	59
90	0	1	1	2	3	3	7	13	20	27	33	40	47	53	60	67
100	0	1	1	2	3	4	7	15	22	30	37	44	52	59	67	74

Table 11A-7: DAS displacement matrix presenting the peak number of kittiwake in the offshore wind farm area plus 2km buffer, during the migration-free breeding bio-season.

Displacement (%)	Mortality rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
10	0	0	0	0	0	0	1	1	2	3	3	4	5	5	6	7
20	0	0	0	0	1	1	1	3	4	5	7	8	9	10	12	13
30	0	0	0	1	1	1	2	4	6	8	10	12	14	16	18	20
40	0	0	1	1	1	1	3	5	8	10	13	16	18	21	23	26
50	0	0	1	1	1	2	3	7	10	13	16	20	23	26	29	33
60	0	0	1	1	2	2	4	8	12	16	20	23	27	31	35	39
70	0	0	1	1	2	2	5	9	14	18	23	27	32	36	41	46
80	0	1	1	2	2	3	5	10	16	21	26	31	36	42	47	52
90	0	1	1	2	2	3	6	12	18	23	29	35	41	47	53	59
100	0	1	1	2	3	3	7	13	20	26	33	39	46	52	59	65

As stated in the EIAR (see chapter 11: Offshore Ornithology), the breeding population of kittiwake within the mean maximum foraging range plus one standard deviation (300.6 km) of the offshore wind farm area was estimated to be 78,274 breeding adults (Seabird Monitoring Programme, 2024). For each adult bird there is approximately 0.898 immature birds within the population (Horswill and Robinson, 2015). The breeding season population is therefore approximately 148,564 individual birds. Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.156) during the breeding season an estimated 23,176 kittiwake would die naturally. The addition of up to one individual represents a <0.01 % increase in mortality.

The impact of disturbance and displacement caused by operational and maintenance activities during the breeding season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with between zero and one individuals estimated to be at risk of mortality during the breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of kittiwake

Kittiwake are considered to have low vulnerability to collision in relation to operational offshore wind farms (Bradbury et al., 2014).

The species has a low reproductive success as they lay two eggs per year, breed after 4 years and overall productivity of < 1 chick fledged per pair in the UK and Ireland (Robinson, 2005; JNCC, 2021). In addition, the species has a decreasing trend in abundance within Ireland and the UK (Cummins *et al.*, 2019 and JNCC, 2021). Therefore, this species is deemed to have a low recoverability.

Kittiwake are considered to have an international (high) conservation value as those individuals present within the offshore wind farm area are likely to form part of the breeding colonies of SPA populations (see Table 11-8 of EIAR chapter 11: Offshore Ornithology). These SPAs are designated for breeding populations of kittiwake and fall within the mean maximum foraging range plus one SD from the offshore wind farm area.

Kittiwake are deemed to be of low vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect – breeding season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

Magnitude of impact – return migration season

For the estimate derived from boat-based surveys, using the breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 768 individuals, the estimated number of kittiwake which could be at risk of mortality from displacement is two to seven bird (30 % displacement, 1-3% mortality) (Table 11A-8). There was no DAS undertaken during the return migration season.

Table 11A-8: Boat-based displacement matrix presenting the peak number of kittiwakes in the offshore wind farm area plus 2 km buffer, during the return migration bio-season.

		Mortality rates (%)															
		0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	1	2	2	3	4	5	5	6	7	8
	10	0	1	2	2	3	4	8	15	23	31	38	46	54	61	69	77
	20	0	2	3	5	6	8	15	31	46	61	77	92	108	123	138	154
	30	0	2	5	7	9	12	23	46	69	92	115	138	161	184	207	230
	40	0	3	6	9	12	15	31	61	92	123	154	184	215	246	276	307
	50	0	4	8	12	15	19	38	77	115	154	192	230	269	307	346	384
	60	0	5	9	14	18	23	46	92	138	184	230	276	323	369	415	461
	70	0	5	11	16	22	27	54	108	161	215	269	323	376	430	484	538
	80	0	6	12	18	25	31	61	123	184	246	307	369	430	492	553	614
	90	0	7	14	21	28	35	69	138	207	276	346	415	484	553	622	691
	100	0	8	15	23	31	38	77	154	230	307	384	461	538	614	691	768

The non-breeding BDMPS for kittiwake was estimated to be 708,147 (Furness, 2015). Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.156; Horswill and

Robinson, 2015) during the post-breeding migration an estimated 144,800 kittiwake would die naturally. The addition of two to seven individuals in the return migration represents a <0.01-0.01 % increase in mortality.

The impact of disturbance and displacement caused by operational and maintenance activities during the return migration season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with between zero and one individuals estimated to be at risk of mortality during the breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of kittiwake

As detailed above as part of the breeding season assessment kittiwake are deemed to be of low vulnerability, low recoverability and high conservation value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect – return migration season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

Magnitude of impact – post-breeding migration season

For the estimate derived from boat-based surveys, using the breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 305 individuals, the estimated number of kittiwake which could be at risk of mortality from displacement is one to three birds (30 % displacement, 1-3% mortality) (Table 11A-9).

For the estimate derived from DAS, using the breeding seasonal peak in the offshore wind farm area plus 2 km buffer of 24 individuals, the estimated number of kittiwake which could be at risk of mortality from displacement is zero birds (30 % displacement, 1-3% mortality) (Table 11A-10)

Table 11A-9: Boat-based displacement matrix presenting the mean peak number of kittiwake in the offshore wind farm area plus 2km buffer, during the post-breeding migration bio-season.

		Mortality rates (%)															
		0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	1	1	1	2	2	2	2	3	3
	10	0	0	1	1	1	2	3	6	9	12	15	18	21	24	27	30
	20	0	1	1	2	2	3	6	12	18	24	30	37	43	49	55	61
	30	0	1	2	3	4	5	9	18	27	37	46	55	64	73	82	91
	40	0	1	2	4	5	6	12	24	37	49	61	73	85	97	110	122
	50	0	2	3	5	6	8	15	30	46	61	76	91	107	122	137	152
	60	0	2	4	5	7	9	18	37	55	73	91	110	128	146	164	183
	70	0	2	4	6	9	11	21	43	64	85	107	128	149	171	192	213
	80	0	2	5	7	10	12	24	49	73	97	122	146	171	195	219	244
	90	0	3	5	8	11	14	27	55	82	110	137	164	192	219	247	274
	100	0	3	6	9	12	15	30	61	91	122	152	183	213	244	274	305

Table 11A-10: DAS displacement matrix presenting the peak number of kittiwakes in the offshore wind farm area plus 2km buffer, during the post-breeding migration bio-season.

Displacement (%) \ Mortality rates (%)	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2
20	0	0	0	0	0	0	0	1	1	2	2	3	3	4	4	5
30	0	0	0	0	0	0	1	1	2	3	4	4	5	6	6	7
40	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10
50	0	0	0	0	0	1	1	2	4	5	6	7	8	10	11	12
60	0	0	0	0	1	1	1	3	4	6	7	9	10	12	13	14
70	0	0	0	1	1	1	2	3	5	7	8	10	12	13	15	17
80	0	0	0	1	1	1	2	4	6	8	10	12	13	15	17	19
90	0	0	0	1	1	1	2	4	6	9	11	13	15	17	19	22
100	0	0	0	1	1	1	2	5	7	10	12	14	17	19	22	24

The non-breeding BDMPS for kittiwake was estimated to be 928,207 birds (Furness, 2015). Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.156; Horswill and Robinson, 2015) during the post-breeding migration an estimated 144,800 kittiwake would die naturally. The addition of zero to three individuals during the post-breeding presents up to a <0.01 % increase in mortality during post-breeding migration.

The impact of disturbance and displacement caused by operational and maintenance activities during the post-breeding migration season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with between zero and one individuals estimated to be at risk of mortality during the breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of kittiwake

As detailed above as part of the breeding season assessment kittiwake are deemed to be of low vulnerability, low recoverability and high conservation value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect – post-breeding migration season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

Table 11A-11: Predicted displacement impacts on kittiwake from the Project alone.

Bio season	Estimated population (offshore wind farm and 2km)		Predicted displacement impacts (rounded to whole birds)	
	Boat	Aerial	Boat	Aerial
Return (spring) migration	768	N/A	2 to 7	N/A
Breeding	74	65	0 to 1	0 to 1
Post-breeding (autumn) migration	305	24	1 to 3	0 to 0
Annual impact			3 to 11	0 to 1

Manx Shearwater

In response to RFI 7.F, the Applicant has provided an assessment of the disturbance and displacement of Manx shearwater during the operational and maintenance phase using the minimum (30% displacement, 1% mortality). and maximum displacement and mortality rates for Manx shearwater (70% displacement, 10% mortality). However, it is noted that this species is not considered sensitive to displacement, and there is currently no evidence to support any specific range of displacement and mortality rates.

Magnitude of impact – Breeding season

For the estimate derived from boat-based surveys, using the breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 690 individuals, the estimated number of Manx shearwater which could be at risk of mortality from displacement is between 2 and 48 birds (70 % displacement, 10% mortality) (Table 11A-12).

For the estimate derived from DAS, using the breeding seasonal peak in the offshore wind farm area plus 2 km buffer of 189 individuals, the estimated number of Manx shearwater which could be at risk of mortality from displacement is between 1 (30% displacement, 1% mortality) and 32 bird (70 % displacement, 10% mortality) (Table 11A-13).

Table 11A-12: Boat-based displacement matrix presenting the mean peak number of Manx shearwater in the offshore wind farm area plus 2 km buffer during the breeding season

Displacement (%) / Mortality rates (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	7	14	21	28	34	41	48	55	62	69
20	1	3	4	7	14	28	41	55	69	83	97	110	124	138
30	2	4	6	10	21	41	62	83	103	124	145	165	186	207
40	3	6	8	14	28	55	83	110	138	165	193	221	248	276
50	3	7	10	17	34	69	103	138	172	207	241	276	310	345
60	4	8	12	21	41	83	124	165	207	248	290	331	372	414
70	5	10	14	24	48	97	145	193	241	290	338	386	434	483
80	6	11	17	28	55	110	165	221	276	331	386	441	496	552
90	6	12	19	31	62	124	186	248	310	372	434	496	558	621
100	7	14	21	34	69	138	207	276	345	414	483	552	621	690

Table 11A-13: DAS displacement matrix presenting the mean peak number of Manx shearwater in the offshore wind farm area plus 2 km buffer during the breeding season

Displacement (%) / Mortality rates (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	6	8	9	11	13	15	17	19
20	0	1	1	2	4	8	11	15	19	23	26	30	34	38
30	1	1	2	3	6	11	17	23	28	34	40	45	51	57
40	1	2	2	4	8	15	23	30	38	45	53	60	68	76
50	1	2	3	5	9	19	28	38	47	57	66	76	85	95
60	1	2	3	6	11	23	34	45	57	68	79	91	102	113
70	1	3	4	7	13	26	40	53	66	79	93	106	119	132
80	2	3	5	8	15	30	45	60	76	91	106	121	136	151
90	2	3	5	9	17	34	51	68	85	102	119	136	153	170
100	2	4	6	9	19	38	57	76	95	113	132	151	170	189

The breeding population of Manx shearwater within the mean maximum foraging range plus one standard deviation (1346.8 ± 1018.7 km) of the offshore wind farm area was estimated to be 1,289,394 breeding adults. For each adult bird there is approximately 0.840 immature birds within the population (Horswill and Robinson, 2015). The breeding season population is therefore approximately 2,372,485 individual birds. Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.130) during the breeding season an estimated 308,423 Manx shearwater would die naturally. The addition of two to up to 48 individuals represents a 0.015 % increase in mortality.

The impact of disturbance and displacement caused by operational and maintenance activities during the breeding season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with between 48 individuals estimated to be at risk of mortality during the breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of Manx shearwater

The species has a low reproductive success as they lay one egg per year, breed after 5 years and overall productivity of < 1 chick fledged per pair in the UK and Ireland (Robinson, 2005). In addition, there is little information on Manx shearwater trends in breeding abundance within Ireland due to this species nesting in burrows as well as the difficulty accessing remote colonies, however the colonies that have been monitored have shown an increase (Harris *et al*., 2024). Therefore, this species is deemed to have medium recoverability.

Manx shearwater are considered to have an international (high) conservation value as those individuals present within the offshore wind farm area are likely to form part of the breeding colonies of SPA populations (see Table 11-8 of EIAR chapter 11: Offshore Ornithology). These SPAs are designated for their breeding populations of Manx shearwater and fall within the mean maximum foraging range plus one SD from the offshore wind farm area.

Manx shearwater are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of the effect – breeding season

Overall, the magnitude of the impact is deemed to be negligible, and the sensitivity of the receptor is medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

Magnitude of Impact – Non-breeding Season

For the estimate derived from boat-based surveys, using the non-breeding seasonal mean peak in the offshore wind farm area plus 2 km buffer of 517 individuals, the estimated number of Manx shearwater which could be at risk of mortality from displacement is between 2 (30% displacement, 1% mortality) and 36 birds (70 % displacement, 10% mortality) (Table 11A-14).

For the estimate derived from DAS, using the breeding seasonal peak in the offshore wind farm area plus 2 km buffer of 32 individuals, the estimated number of Manx shearwater which could be at risk of mortality from displacement is between zero 2 (30% displacement, 1% mortality) and 2 birds (70 % displacement, 10% mortality) (Table 11A-15).

Table 11A-14: Boat-based displacement matrix presenting the mean peak number of Manx shearwater in the offshore wind farm area plus 2 km buffer during the non-breeding season.

		Mortality rates (%)													
		1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	10	1	1	2	3	5	10	16	21	26	31	36	41	47	52
	20	1	2	3	5	10	21	31	41	52	62	72	83	93	103
	30	2	3	5	8	16	31	47	62	78	93	109	124	140	155
	40	2	4	6	10	21	41	62	83	103	124	145	165	186	207
	50	3	5	8	13	26	52	78	103	129	155	181	207	233	259
	60	3	6	9	16	31	62	93	124	155	186	217	248	279	310
	70	4	7	11	18	36	72	109	145	181	217	253	290	326	362
	80	4	8	12	21	41	83	124	165	207	248	290	331	372	414
	90	5	9	14	23	47	93	140	186	233	279	326	372	419	465
	100	5	10	16	26	52	103	155	207	259	310	362	414	465	517

Table 11A-15: DAS displacement matrix presenting the mean peak number of Manx shearwater in the offshore wind farm area plus 2 km buffer during the breeding season.

		Mortality rates (%)													
		1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	10	0	0	0	0	0	1	1	1	2	2	2	3	3	3
	20	0	0	0	0	1	1	2	3	3	4	4	5	6	6
	30	0	0	0	0	1	2	3	4	5	6	7	8	9	10
	40	0	0	0	1	1	3	4	5	6	8	9	10	12	13
	50	0	0	0	1	2	3	5	6	8	10	11	13	14	16
	60	0	0	1	1	2	4	6	8	10	12	13	15	17	19
	70	0	0	1	1	2	4	7	9	11	13	16	18	20	22
	80	0	1	1	1	3	5	8	10	13	15	18	20	23	26
	90	0	1	1	1	3	6	9	12	14	17	20	23	26	29
	100	0	1	1	2	3	6	10	13	16	19	22	26	29	32

The non-breeding BDMPS for Manx shearwater was estimated to be 1,580,895 (Table 11-11 in chapter 11: Offshore Ornithology). Using the published figures provided above and the baseline mortality rate of 0.130; (Horswill and Robinson, 2015) during the non-breeding season an estimated 205,516 Manx shearwater would die naturally. The addition of zero to up to 36 individuals represents a 0.018 % increase in mortality.

The impact of disturbance and displacement caused by operational and maintenance activities during the return migration season is predicted to be of local spatial extent, long term duration, continuous and reversible. It is predicted that the impact will affect the receptor both directly and indirectly, however with up to 36 individuals estimated to be at risk of mortality during the non-breeding season, this impact will be undetectable at a population level. The magnitude is therefore considered to be negligible.

Sensitivity of Manx shearwater

As detailed above, Manx shearwater are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of the effect – non-breeding season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is medium. The effect will, therefore, be of **imperceptible or slight adverse significance**, which is not significant in EIA terms.

11.10.2 Indirect displacement resulting from changes to prey and habitats

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.10.3 Collision risk

Avoidance rate for migratory birds

The assessment of migratory birds (Table 3-2 of appendix 11-6: Offshore Ornithology Migratory Non-seabirds Collision Risk Modelling (EIAR volume 2B)) presents a range of avoidance rates from 95.0 to 99.5%.

The Applicant acknowledges that the avoidance rates of these species have large confidence intervals with little empirical evidence. New evidence on avoidance rates has been reviewed and assessed by Woodward *et al*. (2023) including empirical evidence. The avoidance rates recommended within that report (Table 5 of Woodward *et al*., 2023) indicate that the lowest avoidance rate for any species within SOSSMAT tool is 98.01 ± 0.32% (for mallard). The lower confidence interval of the lowest avoidance rate as determined by Woodward *et al*. (2023) is therefore 97.69%. The Applicant's approach of presenting 95% avoidance can therefore be deemed to be precautionary.

The greatest impact in terms of number of birds was 0.42 dunlin (when using 95% avoidance rate), with all species considered to have zero birds impacted (when rounded to whole birds). (Appendix 11-6: Offshore Ornithology Migratory Non-seabirds Collision Risk Modelling (EIAR volume 2B)). Woodward *et al*. (2023) states that for dunlin, the group avoidance rate for wader should be applied of 99.6 ± 0.002%, therefore using the latest evidence would equate to 0.03 birds.

An updated version, incorporating the work of Woodward *et al*. (2023) and building upon the SOSSMAT framework, has been completed and is presented in Appendix 11-9: mCRM. To model the movements of migratory birds within the footprint of the project, the Marine Scotland Avian Migration Collision Risk Model Shiny Application, hereafter referred to as the mCRM tool ("mCRM App"; HiDef Aerial Surveying Ltd., 2024), was employed. The updated assessment in appendix 11-9: mCRM indicates that the predicted impacts on dunlin are minor and not significant, with up to 0.107 (± 0.034 SD) individuals predicted to be impacted during the pre-breeding season and 0.105 (± 0.034 SD) individuals predicted to be impacted during the post-breeding period (when considering an avoidance rate of 0.999 ± 0.000 SD) (North Irish Sea Array Windfarm Ltd, 2025).

The Applicant has therefore presented a robust and appropriate assessment for the impact on migratory species following current industry guidance and the best scientific evidence available at the time of the drafting.

Gannet – no macro-avoidance

In response to RFI 7.H, the Applicant has provided an assessment of the impact when considering no macro-avoidance for gannet. A summary of the outputs from the assessment is provided in the sections below and shown in Table 11A-16 which is an update to Table 11-41 in chapter 11: Offshore Ornithology. This assessment presents an impact which is an impossibility due to the inability of a bird to be both within the offshore wind farm area but also be displaced. Gannet are highly susceptible to displacement and avoid wind farm array areas and have shown a consistent negative relationship (Dierschke *et al*., 2016, SNCB, 2022).

Table 11A-16: Estimated collisions (both Natural England and JNCC AR) during the breeding and non-breeding season for Band Option 1 and 2 for both the boat-based and DAS density estimate. Note: changes to Table 11-41 in chapter 11: Offshore Ornithology are highlighted in bold.

Ornithological receptor	Band Model Option	Density estimate	Natural England AR			JNCC AR		
			Breeding season	Non-breeding	Annual	Breeding season	Non-breeding	Annual
Common gull	1	Boat-based	0	10.71	10.71	0	10.78	10.78
	2	Boat-based	0	20.27	20.27	0	20.45	20.45
Gannet (70% macro-avoidance included)	1	Boat-based	10.31	10.40	20.71	8.96	9.01	17.96
	2	Boat-based	5.08	5.10	10.18	4.34	4.38	8.72
	2	DAS	4.10	N/A	N/A	3.61	N/A	N/A
Gannet (no macro-avoidance included)	**1**	**Boat-based**	**34.38**	**34.65**	**69.03**	**29.84**	**30.02**	**59.86**
	2	**Boat-based**	**16.9**	**17.02**	**33.92**	**14.47**	**14.61**	**29.08**
	2	**DAS**	**13.69**	**N/A**	**N/A**	**12.04**	**N/A**	**N/A**
Great black-backed gull	1	Boat-based	12.68	40.47	53.16	1.95	6.09	8.03
	2	Boat-based	15.70	50.21	65.91	2.44	7.54	9.98
	2	DAS	2.00	N/A	N/A	0.30	N/A	N/A
Herring gull	1	Boat-based	26.32	50.79	77.11	20.99	40.64	61.63
	2	Boat-based	31.34	60.46	91.80	25.12	48.38	73.50
Kittiwake	1	Boat-based	3.99	43.83	47.82	1.52	13.45	14.97
	2	Boat-based	5.83	50.45	56.28	1.74	15.37	17.11
	2	DAS	3.68	N/A	N/A	1.12	N/A	N/A

Magnitude of impact – breeding season

During the gannet breeding season (April to August), between 34.38 (when using JNCC AR, Band Option 2 and the DAS density estimates) and 10.31 (when using the Natural England AR, Band Option 1 and the boat-based survey density estimates) collisions were predicted to occur due to the Project (Table 3-1 and Table 3-2 of appendix 11-4: Offshore Ornithology Collision Risk Modelling (EIAR volume 2B).

The breeding population of gannet within mean maximum foraging range plus one SD (509.4 km) of the offshore wind farm area was estimated to be 150,897 breeding adults (SMP, 2022 and Burnell *et al.*, 2023). There are both SPA and non-SPA breeding colonies within the mean max foraging range (see Table 11-8 of chapter 11: Offshore Ornithology (EIAR vol. 2B). Within the population present within the impacted area during the breeding season there are immatures in addition to the adults. Horswill and Robinson (2015) estimated that for every adult there is 0.761 juveniles in the breeding season population, therefore the breeding season population within the mean maximum foraging range of the Project is 265,730 birds.

Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.181; see Table 11-12 of chapter 11: Offshore Ornithology) during the breeding season an estimated 48,097 gannet would die naturally. The additional mortality of 34.38 birds during the breeding season as a result of collisions is of negligible magnitude (0.07 % increase in mortality), which would be undetectable at population level.

The impact of collisions is predicted to be of local spatial extent, long term duration, continuous and high reversibility. Therefore, the magnitude is considered to be negligible.

Sensitivity of the receptor

Gannet are considered to have high vulnerability to collision in relation to operational offshore wind farms (Bradbury *et al.,* 2014). In terms of behavioural response to wind farm structures, gannet are considered to be of high vulnerability, with a score of four out of five assigned by Wade *et al.* (2016). Recent studies have shown that during the breeding season, gannet showed a strong avoidance of offshore wind farms (Lane *et al*., 2020; Peschko *et al*., 2021).

Gannet are considered to have an international (high) conservation value as those individuals present within the wind farm array area are likely to form part of the breeding colonies of SPA populations (see Table 11-8 of chapter 11: Offshore Ornithology of the EIAR). These SPAs are designated for their breeding populations of gannet and fall within the mean maximum foraging range plus one SD from the offshore wind farm area.

Although gannet has a low reproductive success (only laying one egg) and does not breed until five years old (Robinson, 2005), the species is deemed to have a medium recoverability given the consistent increasing trend in abundance in Ireland and the UK (Cummins *et al*., 2019 and JNCC, 2021). However, the species has suffered from the outbreak of avian flu during the 2022 breeding season. The consequences of this will not be known for several seasons, when breeding birds return to colonies.

Gannet are deemed to be of high vulnerability, medium recoverability and high conservation value. The sensitivity of the receptor is therefore considered to be high.

Significance of the effect – breeding season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will therefore be of **slight adverse significance,** which is not significant in EIA terms.

Magnitude of impact – non-breeding season

During the gannet non-breeding season (September to March), between 14.61 (when using JNCC AR, Band Option 2 and the DAS density estimates) and 34.65 (when using the Natural England AR, Band Option 1 and the boat-based survey density estimates) collisions were predicted to occur due to the Project (Table 3-1 and Table 3-2 of appendix 11-4: Offshore Ornithology Collision Risk Modelling).

The non-breeding BDMPS for gannet was estimated to be between 536,005 (autumn migration) and 644,739 (spring migration) (see Table 11-11 of chapter 11: Offshore Ornithology of the EIAR). Using the published figures provided above and the baseline mortality rate (all age class mortality rate of 0.181; see Table 11-12 of chapter 11: Offshore Ornithology of the EIAR) an estimated 97,017 gannet would die (using the autumn migration population) naturally and an estimated 116,698 gannet would die (using the spring migration population). The addition of 34.65 individual collisions represents a 0.03 % increase in mortality when using the smaller autumn migration population which is considered more precautionary due to its size compared to the spring population.

The impact of collisions is predicted to be of local spatial extent, long term duration, continuous and high reversibility. Therefore, the magnitude is considered to be negligible.

Sensitivity of the receptor

As detailed above as part of the breeding season assessment gannet are deemed to be of high vulnerability, medium recoverability and high conservation value. The sensitivity of the receptor is therefore considered to be high.

Significance of the effect – non-breeding season

Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will therefore be of **slight adverse significance**, which is not significant in EIA terms.

11.10.4 Combined disturbance and displacement and collision risk

In chapter 11: Offshore Ornithology, gannet was assessed for combined disturbance and displacement. In response to RFI 7.M, a combined assessment for kittiwake is presented below.

Kittiwake

The Applicant considers collision and displacement impacts for Kittiwake to be mutually exclusive. Because no macro-avoidance rate is recommended for kittiwake (unlike for gannet), displaced birds are not treated as remaining within the collision-risk population; therefore a single individual cannot be counted as both displaced and at risk of turbine collision.

Therefore, providing an additive combined impact is considered overly precautionary and likely to overestimate the impacts. However, to address the Board's request, the Applicant has provided below an assessment of the combined impact of collisions and displacement for kittiwake.

As presented within the EIAR (see chapter 11: Offshore ornithology) between 14.97 and 56.28 kittiwake have potential to collide annually. As presented in Table 11A-11, the predicted numbers of birds impacted by displacement ranged from zero to 11 birds, therefore the combined impact of collisions and displacement could be between 14.97 and 67.28 per year.

Where the worst-case of 67.28 birds are impacted the increase in baseline mortality would be 0.05 % increase in baseline mortality (when considering the population of 928,207 during the post-breeding season). An increase in natural mortality of 1% is considered to be the threshold for detectability within a population.

As the increase in baseline mortality is <0.1 % a negligible magnitude is predicted. Overall, the magnitude of the impact is deemed to be negligible, and the sensitivity of the receptor is considered to be high. The effect will therefore be of **slight adverse significance**, which is not significant in EIA terms.

11.10.5 Barrier effect

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.10.6 Predicted mortalities in context of the western Irish population

In this section, the Applicant presents the increase in baseline mortality from the project alone impact using the western Irish Sea population for context. The western Irish Sea is not a delimited biogeographic or oceanographic unit separate from the rest of the Irish Sea; it is contiguous with adjacent waters and is defined only by administrative boundaries. Highly mobile seabirds routinely cross such boundaries, so population estimates for a narrowly defined "western Irish Sea" are not adequate to contextualise the impact of the project. Many individuals using this foraging and passage area are not resident or exclusive to the western Irish Sea but are drawn from multiple breeding colonies and wider regional populations. Consequently, the western Irish Sea population represents only a small portion of the total geographic area used by these birds and is therefore an unreliable basis on its own for assessing the project-level impact.

Nonetheless, the Applicant acknowledges that Ireland's ObSERVE programme (Giralt Paradell et al., 2024) has collected extensive survey data and produced model-based seabird abundance estimates for Stratum 5 (Table 11A-17). ObSERVE conducted aerial transect surveys in summer 2021 (7 July–11 September), summer 2022 (30 June–14 August), and winter 2022/23 (15 November–6 March) across Ireland's Exclusive Economic Zone (EEZ).

The modelled estimates for Stratum 5 therefore provide a regional population context for assessing the project-alone impact. Table 11A-17 presents the Stratum 5 estimates for the western Irish Sea population and the corresponding increase in baseline mortality attributable to the project alone.

This approach addresses the Board's concerns: it specifically responds to gannet-related issues (comment 7K) and to the broader concerns for all species (comment 7P) by using ObSERVE's survey-derived, model-based estimates for Stratum 5 to calculate the project-alone predicted increase in baseline mortality, using the western Irish Sea population as a reference.

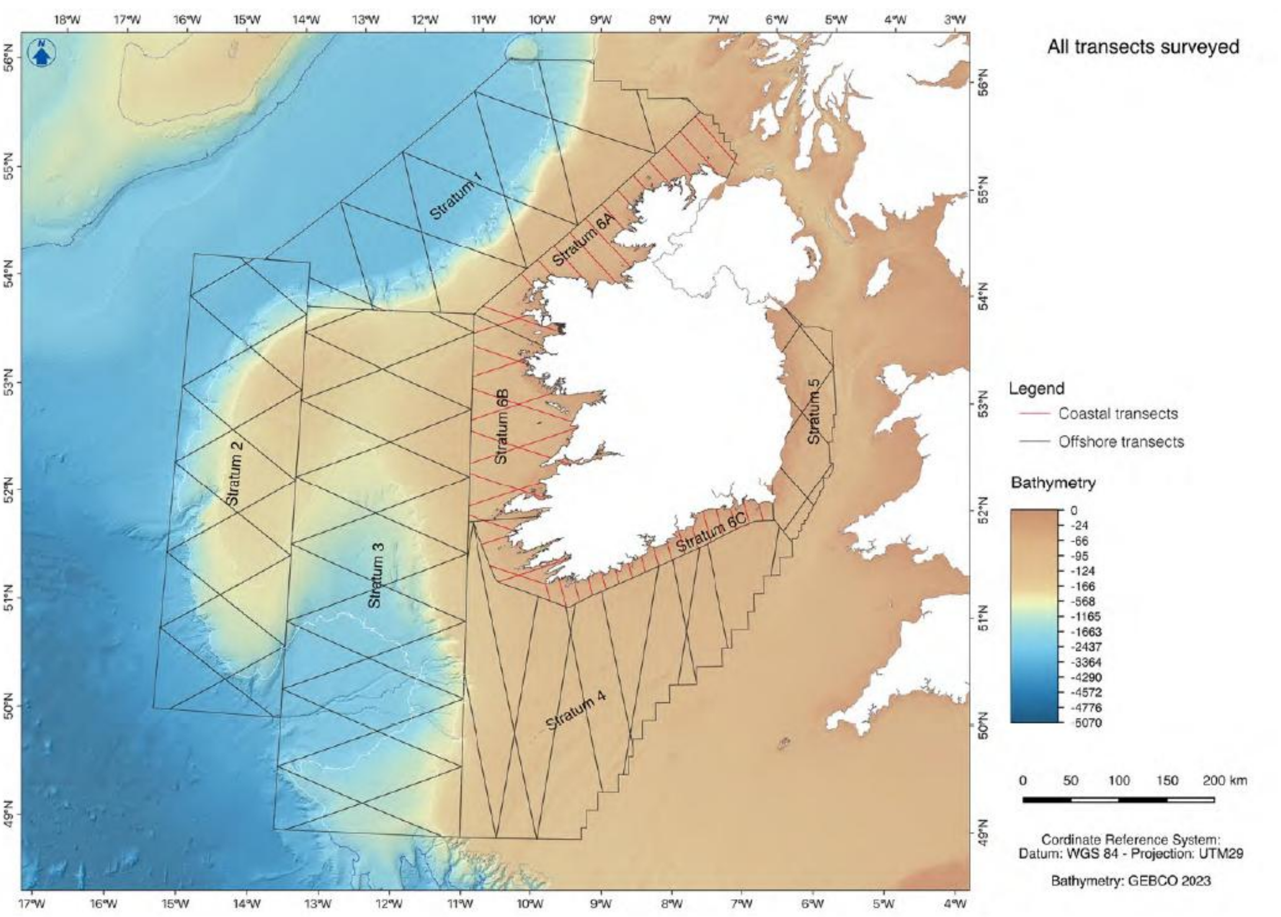

Figure 11A-1: The ObSERVE collection areas and aerial transect lines flown in the summer of 2021 and 2022 and winter of 2022/23. The western Irish Sea is the area covered by Stratum 5.

While ObSERVE provides useful survey-derived, model-based estimates, those outputs are not adequate as the sole basis for regional impact assessment for the following reasons:

- High temporal variability and low precision. ObSERVE shows an almost eight-fold increase in the summer gannet estimate for Stratum 5 between years (Table 11A-17). The 95% confidence interval for gannet in summer 2022 (1,345–330,441) is extremely wide and indicates low precision and high uncertainty for that stratum and season.

- Inconsistent species identification. A substantial proportion of observations are grouped at higher taxonomic levels (e.g., guillemot & razorbill, common gull & herring gull, black-backed gull spp.). Where species are combined, the ObSERVE ratios may not reflect the true species composition in the wider study area, reducing confidence in species-specific impact apportioning.

- Small sample / survey coverage issues for the target sub-area. The combination of large annual fluctuations, wide confidence intervals, and non-specific identifications reduces the reliability of ObSERVE to characterise Stratum 5 robustly and to support robust predicted increase in baseline mortality in the western Irish Sea.

For the reasons outlined above, the Applicant considers that the methodology employed in chapter 11: Offshore Ornithology — specifically using the BDMPS framework (Furness, 2015) for the non-breeding season and the NatureScot approach for the breeding season — provides a more robust and defensible assessment of regional impacts:

Table 11A-17: The ObSERVE data from Stratum 5 compared to the Applicant site-specific data.

Species	Raw abundance in Offshore Ornithology Study Area	ObSERVE summer 2021 with the 95% CI in brackets	ObSERVE summer 2022 with the 95% CI in brackets	ObSERVE winter (2022/23) with the 95% CI in brackets
Great northern diver	837	N/A – too small a sample size	N/A – too small a sample size	N/A – too small a sample size
Manx shearwater	8,043	67,575 (29,328 – 171-528)	101,998 (51,368 – 222,364)	N/A – too small a sample size
Gannet	1,216	2,521 (1,180 – 5,912)	19,897 (1,345 – 330,441)	2,177 (567 – 7,612)
Guillemot	23,878	[1] 146,254 (57,812 – 420,152)	[1] 141,985 (71,971 – 310,418)	[1] 92,607 (65,820 – 147,518)
Razorbill	2,955			
Kittiwake	742	6,595 (3,472 – 13,916)	14,422 (9,822 – 23,291)	27,446 (19,280 – 43,681)
Common gull	323	[2] 1,246 (212 – 8,487)	[2] 864 (325 – 2,596)	[2] 3,214 (1,538 – 8,314)
Herring gull	359			
Great black-backed gull	414	[3] 331 (160 - 770)	[3] 276 (191 – 449)	[3] 1,728 (688 – 5,162)

[1] Razorbill and guillemot were not separated in the ObSERVE data so the combined data are presented. [2] Common gull and herring gull were not separated in the ObSERVE data so the combined data are presented. [3] Great black-backed gull and lesser black-backed gull were not separated in the ObSERVE data so the combined data are presented.

The increase in baseline mortality from the project-alone in context of the model-based population estimates from Giralt Paradell, *et al.* (2024) as a proxy for the western Irish Sea are displayed in Table 11A-18: The % increase in mortality in context of western Irish Sea population below. For the following species it is not possible to contextualise the impact with the western Irish Sea population:

- Great northern diver – There were not enough records of great northern diver from the ObSERVE dataset to compare against.
- Guillemot – Guillemot were grouped with razorbill so there is no reliable population estimate to compare against.
- Razorbill – Razorbill were grouped with guillemot so there is no reliable population estimate to compare against.
- Common gull – Common gull were grouped with herring gull so there is no reliable population estimate to compare against.
- Herring gull – Herring gull were grouped with common gull so there is no reliable population estimate to compare against.
- Great black-backed gull – Great black-backed gull were grouped with lesser black-backed gull so there is no reliable population estimate to compare against.

Table 11A-18: The % increase in mortality in context of western Irish Sea population

Species	Predicted mortality during the breeding season from the project-alone	Predicted mortality during the non-breeding season from the project-alone	Percentage increase in baseline mortality, calculated using the ObSERVE summer 2021 population estimate as the reference	Percentage increase in baseline mortality, calculated using the ObSERVE summer 2022 population estimate as the reference	Percentage increase in baseline mortality, calculated using the ObSERVE winter 2022/23 population estimate as the reference
Manx shearwater (assessment of displacement based on a 70% displacement rate and 10% mortality rate)	48	36	0.55%	0.36%	N/A
Gannet (combined assessment of displacement (80% displacement & 10% mortality) and collision (no avoidance)).	54.38	64.65	11.92	1.51	16.41
Kittiwake (combined assessment of displacement (30% displacement and 3% mortality) and collision)	6.83	60.45	0.66	0.30	1.41

Although the increase in baseline mortality is above 1% of the baseline mortality for gannet in all periods and for kittiwake in the winter period, these must also be considered against the variability of the population estimates (as shown by the 95% confidence intervals in Table 11A-17: The ObSERVE data from Stratum 5 compared to the Applicant site-specific data.), and the inter annual fluctuations. Furthermore, the combined assessment adopts the most precautionary approach, applying the maximum impact ranges for displacement and mortality rates together with the most conservative collision estimates.

As the Applicant has noted above, there is no biological justification for using the anthropogenically defined area "western Irish Sea"; it represents only part of the area used during the breeding season and non-breeding season for highly mobile seabird species, and using this smaller unit needlessly assesses risk to a population that does not exist as a discrete biological entity.

11.10.7 Mitigation and residual effects

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.10.8 Future monitoring

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.11 Cumulative Impact Assessment

An updated Cumulative Impact Assessment is provided in appendix 3-2 of the EIAR Addendum. This includes corrected abundances and biological seasons for razorbill, updating the information originally presented in Table 11-46 of EIAR chapter 11: Offshore Ornithology (EIAR volume 2B).

11.12 Transboundary effects

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.13 Interactions

There are no changes to EIAR chapter 11: Offshore Ornithology.

11.14 Summary of impacts, mitigation measures and residual effects

Table 11A-19 presents an updated summary of the potential impacts, mitigation measures and residual effects in respect to offshore ornithology. Changes are shown in blue text.

Table 11A-19: Summary of potential environment effects, mitigation and monitoring.

Description of impact	Receptor	Phase C	Phase O	Phase D	Measures included in the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Disturbance and displacement	Gannet	x	✓	x	EMP (volume 2A: Appendix 5-1: Environmental Management Plan)	O: Negligible	O: High	O: Slight adverse	None	O: Slight adverse	Monitoring - continual collection of abundance and distributional data in years 0, 1, 3, 5 and 15 post construction. The Year 0 survey is proposed so that an updated pre-construction population can be defined. No impacts are predicted to be significant in EIA terms, so this monitoring is proposed to be undertaken to help provide extra evidence within the Irish Sea to confirm the conclusions of this EIAR.
	Great northern diver	✓	✓	✓		C: Low O: Low D: Negligible	C: High O: High D: High	C: Slight adverse O: Slight adverse D: Slight adverse	None	C: Slight adverse O: Slight to moderate adverse D: Slight adverse	
	Guillemot	✓	✓	✓		C: Negligible O: Negligible D: Negligible	C: High O: High D: High	C: Slight adverse O: Slight adverse D: Slight adverse	None	C: Slight adverse O: Slight adverse D: Slight adverse	
	Razorbill	✓	✓	✓		C: Negligible O: Negligible D: Negligible	C: High O: High D: High	C: Slight adverse O: Slight adverse D: Slight adverse	None	C: Slight adverse O: Slight adverse D: Slight adverse	
	Kittiwake	x	✓	x		O: Negligible	O: Medium	O: Imperceptible or slight adverse	None	O: Imperceptible or slight adverse	
	Manx shearwater	x	✓	x		O: Negligible	O: Medium	O: Imperceptible or slight adverse	None	O: Imperceptible or slight adverse	
	Red-throated diver	✓	✓	✓		C: Negligible O: Negligible D: Negligible	C: Medium O: Medium D: Medium	C: Imperceptible or slight adverse O: Imperceptible or slight adverse D: Imperceptible or slight adverse	None	O: Imperceptible or slight adverse	
Indirect displacement resulting from changes to prey and habitats	Seabirds	✓	✓	✓	EMP	C: Negligible O: Negligible D: Negligible	C: Low to high O: Low to high D: Low to high	C: Imperceptible or slight adverse O: Imperceptible or slight adverse D: Imperceptible or slight adverse	None	C: Imperceptible or slight adverse O: Imperceptible or slight adverse D: Imperceptible or slight adverse	
Collision risk	Common gull	x	✓	x	None	O: Low	O: High	O: Slight adverse	None	O: Slight adverse	
	Gannet	x	✓	x		O: Negligible	O: High	O: Slight adverse	None	O: Slight adverse	
	Great black-backed gull	x	✓	x		O: Low to medium (breeding) O: Low (non-breeding)	O: Low (breeding) O: High (non-breeding)	O: slight adverse (breeding) O: slight adverse (non-breeding)	None	O: Slight adverse	
	Herring gull	x	✓	x		O: Low	O: High	O: Slight adverse	None	O: Slight adverse	
	Kittiwake	x	✓	x		O: Negligible	O: High	O: Slight adverse	None	O: Slight adverse	
Barrier effect	Seabirds	x	✓	x	None	O: Negligible to low	O: Low to high	O: Imperceptible to slight adverse	None	O: Imperceptible to slight adverse	

References

APEM (2017) Mainstream Kittiwake and Auk Displacement Report. APEM Scientific Report P000001836.

BirdLife South Africa (2025). Summary of Bird Monitoring Reports from Operational Wind Energy Facilities in South Africa

Certain, G., Jørgensen, L. L., Christel, I., Planque, B. & Bretagnolle, V. (2015). Mapping the vulnerability of animal community to pressure in marine systems: disentangling pressure types and integrating their impact from the individual to the community level. ICES journal of Marine Science, 72, 1470-1482.

Cook, A., Johnston, A., Wright, L. J. & Burton, N. H. (2012). Strategic Ornithological Support Services Project SOSS-02: A Review of Flight Heights and Avoidance Rates of Birds in Relation to Offshore Wind Farms. Thetford, Norfolk: British Trust for Ornithology.

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.

Giralt Paradell, O., Cañadas, A., Bennison, A., Todd, N., Jessopp, M., Rogan, E. (2024). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2021-2023. Department of the Environment, Climate & Communications and Department of Housing, Local Government & Heritage, Ireland. 260pp

Harris, S.J., Baker, H., Balmer, D.E., Bolton, M., Burton, N.H.K., Caulfield, E., Clarke, J.A.E., Dunn, T.E., Evans, T.J., Hereward, H.R.F., Humphreys, E.M., Money, S. and O'Hanlon, N.J. (2024). Seabird Population Trends and Causes of Change: 1986–2023. British Trust for Ornithology, Thetford, Norfolk

HiDef (2023) Densities of qualifying species within Liverpool Bay/ Bae Lerpwl SPA: 2015 to 2020. Natural England Commissioned Report 440, Natural England

IJntema, G.J., Heida, N., Leemans, J.J., Gymesi, A. & Potiek, A. 2025. Collision effects of North Sea wind turbines on bird species within the "Kader Ecologie & Cumulatie (KEC) 5.0". Report 24-163. Waardenburg Ecology. Culemborg.

Mona OWF (2024). Volume 6, Annex 5.1: Offshore Ornithology Baseline Characterisation Technical Report. Available at: Example RPS report template . Accessed October 2025.

NRW (2025) Advice received by the Mona Offshore Wind Farm Project from NRW, as detailed in Technical Engagement Plan Appendices Part 1 (A to E). Available online at: E4.1_Mona_Technical Engagement Plan - Appendices A-E. Accessed August 2025

RWE (2025). Black Blade study at RWE location Eemshaven. Online press release. Available at: Black Blades | Black Blade pilot project at RWE location Eemshaven

Van Bemmelen, R.S.A., J. de Groeve, A. Potiek (2022) Potential curtailment regimes for offshore wind farms: exploring the relation between wind speed, power yield and bird migration intensity. Spatial variation in migration intensity and optimization of curtailment threshold. Bureau Waardenburg Report 22-171. Bureau Waardenburg, Culemborg.

Vanermen, N., Courtens, W., Van De Walle, M., Verstraete, H., & Stienen, E. (2023). Seabirds and offshore wind farms–Displacement monitoring 2.0. In *Environmental impacts of offshore wind farms in the Belgian part of the North Sea: Progressive insights in changing species distribution patterns informing marine management* (pp. 85-101).

WSP (2022) Collision Risk Modelling Kattegatt Syd Offshore Windfarm. Available at: https://sgavmst.dk/media/pisphlwa/bilaga-k-kollisionsriskmodellering-wsp.pdf (accessed August 2025)