Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note

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Glossary

Term	Meaning
Applicant	Morgan Offshore Wind Limited.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Morgan Array Area	The area within which the wind turbines, foundations, inter-array cables, interconnector cables, scour protection, cable protection and offshore substation platforms (OSPs) forming part of the Morgan Offshore Wind Project: Generation Assets will be located.
Morgan Offshore Wind Project: Generation Assets	This is the name given to the Morgan Generation Assets project as a whole (includes all infrastructure and activities associated with the project construction, operations and maintenance, and decommissioning).
The Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.

Acronyms

Acronym	Description
BDMPS	Biologically Defined Minimum Population Scales
EIA	Environmental Impact Assessment
EWG	Expert Working Group
ExA	Examining Authority
HAT	Highest Astronomical Tide
HRA	Habitats Regulations Assessment
LSE	Likely Significant Effect
ISAA	Information to support an appropriate assessment
JNCC	Joint Nature Conservation Committee
MERP	Marine Ecosystems Research Programme
NRW	Natural Resources Wales
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
SPA	Special Protection Areas
SNCBs	Statutory Nature Conservation Bodies
TCE	The Crown Estate
VAS	Visual Aerial Survey

Units

Unit	Description
°	degrees
km^2	kilometre squared
km	kilometre
m	metre
%	percentage
rpm	Rotations per minute

1 CALCULATION OF INDICATIVE IMPACT ESTIMATES FOR HISTORICAL PROJECTS

1.1 Introduction

1.1.1 Background and context

1.1.1.1 This technical clarification note quantifies the impacts from historical offshore wind projects for which quantitative analyses were not presented in the relevant applications for each project to inform the Morgan Generation Assets application. These historical projects were considered qualitatively in the offshore ornithology Cumulative Effects Assessment (CEA) presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the in-combination assessment presented in the HRA Stage 2 ISAA Part Three: Special Protection Areas and Ramsar sites Assessments (APP-098). The 'Offshore Ornithology Cumulative Effects Assessment and In-combination Gap-fill of Historical Projects' methodology note provided in Appendix B was developed collectively by the Mona Offshore Wind Project, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Wind Farm: Generation Assets project teams; however, this technical clarification note quantifies the impacts from historical offshore wind projects for the Morgan Generation Assets only.

1.1.1.2 During the Statutory Consultation for the Morgan Generation Assets Preliminary Environmental Information Report (PEIR), Natural England, Natural Resources Wales (NRW) and the Joint Nature Conservation Committee (JNCC) (Statutory Nature Conservation Bodies (SNCBs) did not consider it appropriate for Morgan Generation Assets (hereafter referred to as 'The Applicant') to undertake the cumulative (and hence also in-combination) assessments with the inclusions of several 'unknowns' for impacts from historical offshore wind projects. The Applicant was provided with advice from Natural England and endorsed by NRW and JNCC (hereafter referred to as the 'SNCB Advice Note') regarding suggested methodologies for 'gap filling' historical offshore wind projects in October 2023. It was requested that indicative estimates for currently 'unknown' displacement and collision impacts be generated for inclusion in the CEAs and in-combination assessments in order to further facilitate the SNCB's understanding of the total quantitative cumulative and in-combination impact for offshore ornithology.

1.1.1.3 As set out in section 1.1.2, the Applicant considered, during the pre-application phase, the SNCBs Advice Note (provided in October 2023) around 'gap-filling' for historical offshore wind projects and further verbal advice given by SNCBs during the eighth Mona and Morgan Expert Working Group (EWG) held on 15 February 2024. Further consultation details regarding the assessment of historical projects are presented in section D8.5 of the Technical engagement plan appendices Part 4 (Appendix D) (APP-092).

1.1.1.4 As part of the Evidence Plan Process, the Applicant circulated the technical clarification note titled 'Cumulative Effects Assessment (CEA) and In-combination Historical Projects Note – Environmental Statement and Habitats Regulations Assessments Approach' to the SNCBs (emailed on 26 January 2024 and included in section D8.5 of the Technical engagement plan appendices Part 4 (Appendix D) (APP-092)). This previous technical note set out that the approach taken in the Development Consent Order (DCO) application was robust, precautionary, and provided sufficient detail to conclude no significant effects within the Environmental Statement and no AEOI beyond reasonable scientific doubt for the purposes of the Habitats Regulations

Assessments (HRAs) undertaken for the Morgan Generation Assets, consistent with information provided in similar recent offshore wind applications (see section 1.1.2).

1.1.1.5 Natural England and NRW submitted relevant representations into the Morgan Generation Assets examination (RR-026 and RR-027, respectively). They commented that the qualitative assessment included in Volume 2, Chapter 5: Offshore Ornithology (APP-023) does not adequately account for the impacts of historical projects and that a quantitative assessment is required. The Applicant responded to the relevant representations at the Procedural Deadline within the Applicant's Response to Relevant Representations (PD1-017) indicating that a clarification note addressing the SNCB concerns was in production and would be submitted to the Examination. This technical clarification note therefore presents a quantitative assessment of the relevant historical projects, using a methodology recommended in the SNCB Advice Note (provided to the Applicant in October 2023) to generate indicative numbers for currently unquantified impacts from historical projects.

1.1.1.6 The approach adopted by the Applicant is described in section 1.1.3 and section 2, Methodology, of this note, including details of how the approach takes account of SNCB advice whilst also ensuring a robust and defensible methodology. It is acknowledged within the SNCBs Advice Note that "the approach detailed…is flawed", and while the Applicant also acknowledges the limitations (which are set out in section 4.1), the approach presented in this technical clarification note is considered to be the most robust and repeatable for the purposes of producing indicative estimates for currently unquantified impacts from historical projects as requested by SNCBs.

1.1.1.7 The Applicant notes that Natural England originally tendered a quantitative assessment of historical projects as a strategic project (as acknowledged in the sixth Expert Working Group (EWG) meeting on 19 October 2023 – see D.7.1 of Technical Engagement Plan Appendices - Part 1 (A to E) (APP-042)) but this has not been awarded and completed in time for the Morgan Generation Assets DCO application and Examination. The Applicant agrees that data gaps associated with historic offshore wind projects are an aspect of cumulative impact assessments that would be better addressed at the strategic level rather than the project level. The Applicant is continuing to engage with SNCBs to understand any proposals forthcoming in relation to cumulative assessments. However, the Applicant considers that the quantitative assessment approach using a methodology recommended in the SNCBs Advice Note and the results presented in this technical clarification note provide the required information in order to resolve this matter.

1.1.1.8 A summary of the methodology and results in an earlier draft of this note were presented to the SNCBs on the 29 August 2024. Advice received from the SNCBs during the presentation on 29 August 2024 has been incorporated into this Technical Note as set out in Table 1.1.

Table 1.1: Post-application consultation and engagement regarding request for cumulative effects assessment and in-combination gap-fill of historical projects.

Consultee and reference to comment	Comment summary	Response to issue raised and/or where considered in this technical note
NRW relevant representation (RR-027)	Request for the Applicant to undertake gap-filling for historical offshore wind projects in the	This technical clarification note quantifies the impacts from historical offshore wind projects for which quantitative analyses were not presented
Natural England relevant representation (RR-026)		

Consultee and reference to comment	Comment summary	Response to issue raised and/or where considered in this technical note
RSPB relevant representation (RR-035)	eastern Irish Sea, in line with the SNCB advice note.	in the Morgan Generation Assets application due to data availability.
Meeting with NRW, the JNCC and Natural England on 29 August 2024 (Appendix E)	Natural England feedback: Broadly agree that the approach provides the information requested by SNCBs, but clarification is required on a few points. The results suggest that some of the historic projects do contribute to the cumulative effect so SNCBs maintain their position that this quantification was necessary. We are happy with the general approach and the use of MERP makes sense. Agree that the risk of adverse effects from these projects is low and they are well sited, and that the use of a proxy approach (as applied by the White Cross offshore wind farm) is not advised for the Mona Offshore Wind Project and the Morgan Generation Assets.	The Applicant welcomes this feedback and, on this basis, has made no changes to the methodology outside addressing further feedback listed in this table. The Applicants welcomes agreement that the MERP data is the best evidence available to characterise baseline abundance given its spatial coverage and more recent temporal coverage (see paragraph 2.1.2.1). The Applicant also welcomes the agreement that the conclusions of this assessment do not alter the conclusions presented in the application and that the risk of adverse effects is low.
	NRW feedback: The use of the MERP data is certainly more repeatable and defensible than the proxy approach, but clarification is required on a few points. In general, NRW feel the risk of adverse effects is low but need clarity on a few points to ensure it can be ruled out beyond reasonable scientific doubt.	
	The JNCC feedback: Agree with Natural England. Clarification is needed to rule out adverse effects, but agree risk is low.	

Consultee and reference to comment	Comment summary	Response to issue raised and/or where considered in this technical note
	Request for the project to consider further justification for the use of percentage of birds in flight from Mona, Morgan Generation Assets and Morecambe Generation Assets surveys for projects that are closer to the coast and may have different percentages of birds in flight.	Section 2.2.1 discusses the available data from other projects that are closer to the coast than the Mona, Morgan and Morecambe projects (including Awel y Môr, Walney Extension and Burbo Bank Extension). Comparable data were available from the Awel-y-Môr offshore wind farm and Table 2.7 presents the percentage of birds flying at the Awel Y Môr offshore wind project in addition to the percentage of birds in flight from Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets. The proportions of birds in flight for the Awel Y Môr offshore wind project are similar to those at the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets, therefore the use of the original birds in flight percentages from the Mona, Morgan and Morecambe offshore wind farms for the additional projects is justified.
	Request for the project to present a month-by-month breakdown if possible or using seasonal values if this is not feasible.	A seasonal and monthly breakdown of the proportions of flying birds within Mona, Morgan and Morecambe DAS is presented in Appendix D
JNCC, Natural England and NRW joint written feedback on 6 September 2024 (via email)	Request for justification for the use of deterministic CRM as opposed to stochastic CRM.	An explanation is provided in paragraph 2.2.5.1. The CRMs for the additional projects was run deterministically as the data sources used to estimate density data did not provide variation around the mean value. Similarly the wind turbine parameters (e.g. rotor speed, wind availability etc.) are not presented with variation and therefore a stochastic model can not be run.
	Request for all wind farm parameters to be presented for added clarity and reproducibility of the CRM.	Table 2.8 in this technical clarification note now presents all information necessary to run the CRMs.
	Request for clarification on Burbo Bank OWF predicted collision impacts being higher when using as-built parameters compared to consented.	As shown within Table 2.8 the air gap for Burbo Bank reduced from 29 m to 26 m between consented and as-built, respectively. A reduction in air gap increases collision risk estimates.
	The SNCB's note that the Marine Licence application for Llyr Offshore Wind Farm has been submitted to NRW licensing and is now available on the public register.	The Applicant welcomes this information. The Marine Licence application for Llyr Offshore Wind Farm became available on 2 September 2024 and will be included in the Applicant's Review of Cumulative Effects Assessment and In-Combination Assessment note to be submitted into the Examination at a future deadline. It is not featured in this technical note as it was not included in the application as there was no information in the public domain at that time.

1.1.1.9 The Applicant maintains that the approach in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the in-combination assessment of the HRA Stage 2 ISAA

Part Three: Special Protection Areas and Ramsar sites Assessments (APP-098) is robust and includes sufficient detail to conclude no significant effects within the Environmental Statement and no AEOI beyond reasonable scientific doubt. The Applicant considers that this technical clarification note is above and beyond the requirements for a robust application but provides the information requested by SNCBs via the SNCB Advice Note (i.e. indicative estimates for currently unquantified impacts from historical projects) in order to further facilitate the SNCBs understanding of the total cumulative and in-combination impact for offshore ornithology.

1.1.2 Approach at application

1.1.2.1 The scope of any assessment and information presented within a Report to Inform the Appropriate Assessment or Information to Support Appropriate Assessment (ISAA) must be considered in the context of what is required by the legal regime under the Conservation of Offshore Marine Habitats and Species Regulations 2017 (Marine Habitats Regulations). The appropriate test is whether it can be ascertained beyond reasonable scientific doubt that there will be no AEOI on European sites. That conclusion must be reached by taking into account the best available scientific evidence. The Courts have re-iterated on a number of occasions that the conclusion reached in an appropriate assessment "cannot realistically require ascertainment of absolute certainty that there will be no adverse effects"[1]. It is entirely appropriate for an Appropriate Assessment to be undertaken, working with estimates and expert judgement, provided that there is sufficient information available to allow a conclusion to be reached beyond reasonable scientific doubt.

1.1.2.2 The Applicant's approach for the DCO application was developed to ensure that the assessments of the Morgan Generation Assets are robust and precautionary. They provide sufficient detail to enable a conclusion of no significant effects within the Environmental Statement and no AEOI beyond reasonable scientific doubt for the purposes of the HRA undertaken for the Morgan Generation Assets. This includes consideration of all projects that may act cumulatively/in-combination with the focal project, either quantitatively or qualitatively, depending on the availability of data.

1.1.2.3 It must be noted that the Applicant has given proper consideration to the S42 comments on the PEIR and receipt of the SNCB Advice Note by providing a detailed quantitative or qualitative (where quantitative information was not available) assessment of these historical projects within the DCO application which the Applicant considers to be a robust assessment to allow no conclusion of no significant effects and no AOEI to be reached.

1.1.2.4 Following detailed Section 42 comments on the PEIR and receipt of the SNCB Advice Note, the Applicant updated the CEA and in-combination assessments ahead of application. The updates took account of the first approach outlined in the SNCB Advice Note (see section 1.1.3) which involved the review of project-specific documentation for historical projects to ascertain whether quantitative information was available. In the absence of a quantitative assessment for historical projects, a qualitative assessment was presented using information from project-specific documentation. For each project and species considered in the CEA, the reasons as to why quantitative estimates of impacts are unavailable, the results of the qualitative assessment and the final conclusion were presented in the application. A qualitative

[1] 1 See decision of the Court of Justice of the European Union in Waddenzee (C-127/02)

assessment was presented at application for all projects which had previously (within the PEIR) had not been assessed quantitatively as part of their respective applications.

1.1.2.5 The Applicant considers the application methodology to be precautionary and robust for assessing impacts from historical offshore wind farm projects, using the best available scientific information with appropriate consideration of the SNCB advice. The approach provides an understanding of the cumulative or in-combination impacts stemming from these historical offshore wind farm projects, thereby enabling a robust assessment of the risks associated with significant effects or AEOI with greater certainty. Full justification for the approach presented in the application is set out in section D8.5 of the Technical engagement plan appendices Part 4 (Appendix D) (APP-092).

1.1.2.6 The CEA presented within the application is consistent with the approach taken for previous offshore wind farm projects in UK waters. The Applicant considers the CEA presented within the application goes beyond other projects (e.g. for the recently consented Awel-y-Môr offshore wind farm) and plan level HRAs (e.g. The Crown Estate, 2024) with the presentation of the qualitative assessment of historical projects, which has not been required previously. The Secretary of State (or other equivalent Competent Authority) has been able to conclude that other developments would not have an AEOI on European sites without such information being provided, including the recently consented Awel-y-Môr offshore wind farm.

1.1.3 Approach to updating CEA / in-combination assessment

1.1.3.1 As set out above, written advice was provided by the SNCBs around ‘gap-filling’ for historical offshore wind projects. The SNCB Advice Note recommended three approaches to quantifying impacts for historical projects:

1. Review the submitted environmental statement. It is accepted that displacement mortality / collision risk estimates may not be presented. However, if there is abundance data, utilise this to populate project-specific displacement matrices / run project-specific collision risk models (CRMs) for relevant species.
2. If no abundance data is available, use a nearby wind farm as a proxy. Scale the impact to the size of the historical project when compared to the proxy.
3. If no abundance data is available and to provide a more rigorous assessment, use the best available bird density estimates and known array footprint plus buffers to generate refined project-specific assessments of displacement and collision.

1.1.3.2 The first approach was considered in the offshore ornithology documents submitted at application whereby site-specific abundance data for historical projects from submitted Environmental Statements were used to generate a quantified impact. The impacts from historical offshore wind projects for which quantitative analyses was not possible due to data availability were considered qualitatively.

1.1.3.3 The Applicant has not progressed the second approach (i.e. use of proxy data) due to very high levels of variation presented within nearby windfarms. After considering this approach in consultation between the Mona Offshore Wind Project, Morgan Generation and Morecambe Generation ornithology consultants, it was concluded that there is no pragmatic or consistent way to use proxy wind farms due to differences in site-specific conditions between projects; therefore, that approach has not been pursued further. Further detail on why proxy data is not considered appropriate is presented in Appendix B.

1.1.3.4 The Applicant has therefore undertaken what the SNCB Advice Note describes as a more '*more rigorous assessment'* to gap-fill these historical projects in line with the third approach outlined in paragraph 1.1.3.1 above. As stated within the SNCBs advice *'If baseline characterisation data are not available for a given "gap-filling" project, MERP, strategic VAS of OWF areas, or the recent Welsh Atlas data could be considered'.* The Applicant considered it more appropriate to use the data outputs of the Marine Ecosystems Research Programme (MERP) (Waggitt *et al*., 2020) (hereafter referred to as MERP data), as recommended by the SNCBs. The MERP data produces average density estimates at a 10x10 km grid square resolution of the entire northeast Atlantic using data from aerial and boat-based surveys from 1980 to 2018. This large temporal and spatial coverage represents the best available data within this area. Using a published source of data also removes potential differences in reproduction and analysis of the data.

1.1.3.5 Further information on the gap-filling methodology used by the Applicant and the species and historical projects that this has been applied is provided in Section 2 and is supported by the methodology technical note provided to the SNCBs on 2 August 2024 (Appendix B).

1.1.4 Structure of the report

1.1.4.1 This report is structured as follows:

- Section 1 provides and introduction and background to the report
- Section 2 presents the methods on how the displacement and collision risk assessments for the additional projects have been undertaken
- Section 3 presents the results for the following assessments:
  - cumulative and in-combination displacement assessment (section 3.1)
  - cumulative and in-combination collision risk assessment (section 3.2) combined cumulative and in-combination displacement and collision risk (section 3.3) displacement and collision combined for both EIA and HRA assessments
- Section 4 provides a discussion on the conclusions of this note and other pertinent factors.

1.1.4.2 Appendix A provides more detail in relation to the estimation of cumulative and in-combination impacts.

1.1.4.3 Appendix B provides the Offshore Ornithology Cumulative Effects Assessment And In-Combination Gap-Filling Historical Projects Note which was submitted to the SNCBs on the 2 August 2024.

1.1.4.4 Appendix C provides the monthly densities for the additional projects used in collision risk modelling.

2 METHODOLOGY

2.1 Displacement

2.1.1 Projects for consideration

2.1.1.1 The species assessed for cumulative displacement impacts in the Morgan Generation Assets Environmental Statement were kittiwake, guillemot, razorbill, Manx shearwater and gannet (Section 5.11.2 in Volume 2, Chapter 5: Offshore ornithology (APP-023)). In Section 1.6.3 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), in-combination displacement impacts were considered for guillemot at the Flannan Isles SPA and kittiwake at the Ireland's Eye SPA, the North-west Irish Sea SPA and the Cape Wrath SPA.

2.1.1.2 Some of the historical developments considered as part of the cumulative and in-combination assessments did not quantify displacement impacts for some species often due to limited data at the time on species' behavioural response to the presence of offshore turbines or the lack of an accepted method for estimating such impacts. As a result the cumulative and in-combination assessments for each species presented for the Morgan Generation Assets considered these projects qualitatively. Table 2.1 identifies the extent to which each project was considered quantitatively in the cumulative and in-combination assessments presented for the Morgan Generation Assets. For some projects, a full dataset of impacts is available for all seasons whereas for others only a partial dataset representing only a subset of the seasons relevant to the species in question. These are identified using 'Full' and 'Partial' in Table 2.1.

Table 2.1: Quantification of displacement impacts for projects when considered in the cumulative and in-combination assessments of the Morgan Generation Assets. Projects which were included on a fully quantitative basis are highlighted green, those that were partially quantified are highlighted in yellow and those that were not considered quantified are highlighted in blue.

Project	Extent displacement was quantified (fully, partially or not)				
	Kittiwake	Guillemot	Razorbill	Manx shearwater	Gannet
Tier 1					
Awel y Môr Offshore Wind Farm	Full	Full	Full	Full	Full
Burbo Bank Extension Offshore Wind Farm	Full	Full	Partial	Partial	Full
Burbo Bank Offshore Wind Farm	None	None	None	None	None
Erebus Floating Wind Demo	Full	Full	Full	Full	Full
Gwynt y Môr Offshore Wind Farm	None	None	None	None	None
Mona Offshore Wind Project	Full	Full	Full	Full	Full
Ormonde Wind Farm	Partial	Partial	Partial	Partial	Partial

Project	Extent displacement was quantified (fully, partially or not)				
	Kittiwake	Guillemot	Razorbill	Manx shearwater	Gannet
Rampion Offshore Wind Farm	Full	No connectivity	No connectivity	None	No connectivity
Rampion 2 (Rampion Extension) Offshore Wind Farm	Full	No connectivity	No connectivity	None	No connectivity
Robin Rigg Offshore Wind Farm	Partial	Partial	Partial	Partial	Partial
TwinHub (Wave Hub Floating Wind Farm)	Partial	Full	Partial	Partial	Partial
Walney 1 & 2 Offshore Wind Farm	None	None	None	None	None
Walney (3 & 4) Extension Offshore Wind Farm	Full	Full	Partial	Partial	Full
West of Duddon Sands Offshore Wind Farm	Partial	Partial	Partial	Partial	Partial
West of Orkney Windfarm	Partial	Full	Full	Full	Full
White Cross Offshore Windfarm	Full	Full	Full	Full	Full
Tier 2					
Morecambe Offshore Windfarm Generation Assets	Full	Full	Full	Full	Full

2.1.2 Abundance estimation

2.1.2.1 If baseline characterisation data from project-specific documentation were not available for a given historical project or were not presented in a usable format (e.g. monthly population estimates) to allow for the calculation of displacement impacts, as incorporated into the assessments presented in the application, the Applicant obtained data on seabird distribution from the Marine Ecosystems Research Programme (MERP) (Waggitt *et al.*, 2020) as recommended by the SNCB's Advice Note from October 2023. The Applicant considers the MERP data the best evidence available to characterise baseline abundance given its spatial coverage (the northeast Atlantic) and relatively recent temporal coverage (1980 and 2018) when compared to other datasets (e.g. the SEAMAST dataset; Bradbury *et al.*, 2014). However, the publicly available MERP dataset represents relative and not absolute density estimates; therefore, any predicted impacts presented should be taken as potential and not absolute impacts. The data source used for each species in each season at each project is presented in Table 2.2.

Table 2.2: Summary of data sources used to calculate population estimates for relevant projects.

Projects	Species of relevance	Seasons of relevance	Data source
Burbo Bank Offshore Wind Farm	All	All	MERP data have been used for Burbo Bank for all species and all seasons.
Burbo Bank Extension Offshore Wind Farm	Razorbill	Pre- and post-breeding seasons	MERP data have been used for razorbill and Manx shearwater in the pre- and post-breeding seasons.
	Manx shearwater		
Gwynt y Môr Offshore Wind Farm	All	All	MERP data have been used for Gwynt y Môr for all species and all seasons.
Ormonde Wind Farm	All	Non-breeding seasons	MERP data are used in the non-breeding season for all species
Rampion Offshore Wind Farm	Manx shearwater	All	MERP data have been used for Manx shearwater in all seasons
Rampion 2 (Rampion Extension) Offshore Wind Farm	Manx shearwater	All seasons	Project-specific data have been used for Manx shearwater
Robin Rigg Offshore Wind Farm	All	Non-breeding seasons	MERP data are used for Robin Rigg for all species in non-breeding seasons.
TwinHub (Wave Hub Floating Wind Farm)	Kittiwake, Manx shearwater, gannet	Pre-breeding season	MERP data are used in the pre-breeding season for all species
	Razorbill	Pre- and post-breeding seasons	MERP data have been used for razorbill in the pre- and post-breeding seasons
Walney 1 & 2 Offshore Wind Farm	All	All	MERP data are used for Walney 1 & 2 for all species in all seasons.
Walney (3 & 4) Extension Offshore Wind Farm	Razorbill, Manx shearwater	Pre-breeding season	MERP data are used in the non-breeding season for both species
West of Duddon Sands Offshore Wind Farm	Kittiwake, guillemot, Manx shearwater, gannet	Non-breeding seasons	MERP data are used for Walney 1 & 2 for all species in all relevant seasons.
	Razorbill	Breeding, pre-breeding and post-breeding seasons	
West of Orkney	Kittiwake	Post-breeding season	Project-specific data have been used for kittiwake in the post-breeding season

2.1.2.2 Data were extracted from the publicly available download of the MERP data which included monthly density estimates at a 10 x 10 km resolution (Waggitt *et al.*, 2020). Each "gap-filled" project was loaded into QGIS (version 3.34) and overlaid with the MERP data. The MERP data was then clipped to each of the projects plus a 2 km buffer for which gap-filling was undertaken. The spatial overlap was then calculated for each of the 10 x 10 km grid squares (km^2), which allowed the abundance to be estimated. A worked example is presented below for northern gannet at the Gwynt y Môr Project.

2.1.2.3 The Gwynt y Môr array area plus 2 km buffer overlaps with five 10 x 10 km^2 squares. Each of the five squares have a different density estimate for gannet (Table 2.3). The area of each grid square which overlaps with the wind farm is then multiplied by the density of birds to provide an abundance estimate. The summed total of all abundances within each of the 10 x 10 km grid squares provided a relative abundance estimate of birds present within the Gwynt y Môr array area plus 2 km buffer.

Table 2.3: Worked example of the calculation of population estimates for gannet at Gwynt y Môr plus a 2 km buffer using the MERP dataset (Waggitt *et al.*, 2020).

Grid square	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Area (km^2)
Density (birds per km^2)													
1	0.079	0.074	0.088	0.111	0.125	0.147	0.172	0.190	0.187	0.141	0.101	0.088	55.13
2	0.065	0.061	0.072	0.091	0.103	0.122	0.143	0.159	0.156	0.117	0.083	0.072	81.89
3	0.060	0.056	0.067	0.085	0.096	0.114	0.134	0.149	0.147	0.110	0.078	0.067	5.42
4	0.067	0.063	0.075	0.094	0.106	0.126	0.149	0.165	0.162	0.122	0.086	0.075	11.86
5	0.062	0.058	0.068	0.087	0.098	0.116	0.137	0.153	0.150	0.112	0.080	0.069	8.13
Abundance													
1	4.37	4.10	4.87	6.13	6.87	8.11	9.48	10.45	10.31	7.79	5.58	4.85	N/A
2	5.31	4.97	5.91	7.47	8.40	9.97	11.72	12.99	12.80	9.60	6.83	5.90	N/A
3	0.33	0.31	0.36	0.46	0.52	0.62	0.73	0.81	0.79	0.59	0.42	0.36	N/A
4	0.80	0.74	0.89	1.12	1.26	1.50	1.76	1.95	1.93	1.44	1.02	0.89	N/A
5	0.50	0.47	0.56	0.70	0.79	0.95	1.12	1.24	1.22	0.91	0.65	0.56	N/A
Total	**11.31**	**10.59**	**12.58**	**15.89**	**17.85**	**21.15**	**24.81**	**27.44**	**27.06**	**20.34**	**14.50**	**12.56**	**N/A**

2.1.3 Modelling parameters

2.1.3.1 The displacement rates used to assess displacement are identical to those used in Volume 2, Chapter 5: Offshore ornithology (APP-023) and are summarised in Table 2.4. A range of mortality rates is applied with the upper value defined based on the mortality rates applied in the Secretary of State's HRA as part of the Sheringham Shoal Extension and Dudgeon Extension offshore wind farms and Hornsea Four offshore wind farm decision for guillemot and razorbill. Whilst not explicitly considered in the Secretary of State's HRA for the aforementioned projects, these rates are also considered applicable to the other species incorporated into the displacement assessments presented in this report.

Table 2.4: Displacement and mortality rates used for assessment.

Species	Displacement rate (%) (evidence-based rate in brackets)	Mortality rate (%) (evidence-based rate in brackets)
Kittiwake	30 to 70 (50)	1 to 2 (1)
Guillemot	30 to 70 (50)	1 to 2 (1)
Razorbill	30 to 70 (50)	1 to 2 (1)
Manx shearwater	30 to 70 (50)	1 to 2 (1)
Gannet	60 to 80 (70)	1 to 2 (1)

2.1.4 Assessment approach

2.1.4.1 The increase in background mortality from displacement mortality (from both the original cumulative and in-combination assessments in both Volume 2, Chapter 5: Offshore ornithology (APP-023) or HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and the cumulative and in-combination assessments presented in this report) for a range of displacement mortalities is then compared. This includes the upper and lower displacement rates in the range presented in Table 2.4 for each species alongside the evidence-based displacement rate as applied by the Applicant in the application assessments and the upper and lower mortality rates also presented in Table 2.4.

2.1.4.2 Where the change in baseline mortality is considered to be material (i.e. would lead to a change in the assessment conclusions reached in either Volume 2, Chapter 5: Offshore ornithology (APP-023) or HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) then further consideration of the associated impact is provided in the relevant section. If the change is not considered to be material in assessment terms then the assessment conclusions reached in Volume 2, Chapter 5: Offshore ornithology (APP-023) or HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) are considered to remain valid.

2.1.4.3 In addition, consideration is given to a range of other impact scenarios, applying different displacement and mortality rates to determine how the inclusion of additional projects would influence the assessment process. This range is defined at the lower end by the lower rates recommended by the EWG and at the upper end by the rates applied Secretary of State within the HRAs for the Sheringham Shoal and Dudgeon Extension projects and Hornsea Four offshore wind farm.

2.2 Collision

2.2.1 Projects for consideration

2.2.1.1 The species assessed for cumulative collision impacts in the Morgan Generation Assets Environmental Statement were kittiwake, great black-backed gull, herring gull, lesser black-backed gull and gannet (Section 5.11.3 in Volume 2, Chapter 5: Offshore ornithology (APP-023). In Section 1.6.3 of HRA Stage 2 information to support an

appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), in-combination collision impacts were considered for kittiwake at the Ireland's Eye SPA, the North-west Irish Sea SPA and the Cape Wrath SPA, herring gull at the Morecambe Bay and Duddon Estuary SPA / Morecambe Bay Ramsar Site and great black-backed gull at the Isles of Scilly.

2.2.1.2 Some of the older developments considered as part of the cumulative and in-combination assessments did not quantify collision impacts for some species often due to limited data at the time on species' behavioural response to the presence of offshore turbines or the lack of an accepted method for estimating such impacts. As a result the cumulative and in-combination assessments for each species presented for the Morgan Generation Assets considered these projects qualitatively. Table 2.5 identifies the extent to which each project was considered quantitatively in the cumulative and in-combination assessments presented for the Morgan Generation Assets.

Table 2.5: Quantification of collision impacts for projects when considered in the cumulative and in-combination assessments of the Morgan Generation Assets. Projects for which were included on a fully quantitative basis are highlighted green, those that were not considered quantified are highlighted in blue.

Project	Extent collision impact was quantified (fully or not)				
	Kittiwake	Great black-backed gull	Herring gull	Lesser black-backed gull	Gannet
Tier 1					
Awel y Môr Offshore Wind Farm	Full	Full	Full	None	Full
Burbo Bank Offshore Wind Farm	None	None	None	Full	None
Burbo Bank Extension Offshore Wind Farm	Full	None	Full	Full	Full
Erebus Floating Wind Demo	Full	Full	Full	Full	Full
Gwynt y Môr Offshore Wind Farm	None	None	None	Full	None
Mona Offshore Wind Project	Full	Full	Full	Full	Full
Ormonde Wind Farm	Full	Full	Full	Full	Full
Rampion Offshore Wind Farm	Full	Full	No connectivity	No connectivity	No connectivity
Rampion 2 (Rampion Extension) Offshore Wind Farm	Full	Full	No connectivity	No connectivity	No connectivity
Robin Rigg Offshore Wind Farm	None	None	None	None	None
TwinHub (Wave Hub Floating Wind Farm)	Full	Full	Full	Full	Full
Walney 1 & 2 Offshore Wind Farm	None	None	None	Full	None
Walney (3 & 4) Extension Offshore Wind Farm	Full	Full	Full	Full	Full

Project	Extent collision impact was quantified (fully or not)				
	Kittiwake	Great black-backed gull	Herring gull	Lesser black-backed gull	Gannet
West of Duddon Sands Offshore Wind Farm	None	None	None	Full	None
West of Orkney Windfarm	Full	No connectivity	None	None	Full
White Cross Offshore Windfarm	Full	Full	Full	Full	Full
Tier 2					
Morecambe Offshore Windfarm Generation Assets	Full	Full	Full	Full	Full

2.2.2 Density estimation

2.2.2.1 The calculation of densities used for collision risk modelling for kittiwake, herring gull, lesser black-backed gull and gannet followed the same method as for displacement. The density of each species within each of the 10 x 10 km grid squares presented within the MERP data was extracted (Waggitt *et al.*, 2020). An average density was used per month, with the average taken from the different squares which overlap with the project.

2.2.2.2 Great black-backed gull is not one of the species included in the MERP dataset and therefore a different data source has been used to calculate densities for use in collision risk modelling for relevant projects. The dataset chosen was the SeaMAST dataset which was considered the most appropriate based on the spatial and temporal coverage associated with the dataset (Bradbury *et al.*, 2014). The SeaMAST dataset includes much of the data incorporated into the MERP dataset plus many other datasets, although datasets older than those included in MERP, and provides abundance data for a wider array of species.

2.2.2.3 The SeaMAST data is presented at 3 x 3 km resolution for both flying and sitting birds and with a breakdown for boat-based and aerial survey data. As the great black-backed gull densities presented from the aerial surveys were negligible, the boat-based survey data was used for collision risk modelling on a precautionary basis however, it should be acknowledged that boat-based surveys consistently record larger densities of gull species, due to attraction of gulls to boats.

2.2.2.4 The SeaMAST dataset presents data on a seasonal basis and therefore the datasets reflecting the seasonal extents defined by Furness (2015) were selected for density calculations. The density data obtained were considered applicable to each month within the relevant season.

2.2.2.5 As with the MERP data, the SeaMaST data has multiple grid squares covering the historical projects, and therefore, the average density across the squares was used in the CRM.

2.2.2.6 The data source used for each species in each season at each project is presented in Table 2.6.

Table 2.6: Summary of data sources used to calculate density data for relevant projects.

Projects	Species of relevance	Seasons of relevance	Data source
Awel y Môr Offshore Wind Farm	Lesser black-backed gull	All	Species not considered, project-specific assessment concluded: '*Recorded in negligible numbers, therefore the level of potential impact would be indistinguishable from natural fluctuations in (BDMPS) baseline mortality*'.
Burbo Bank	Kittiwake, great black-backed gull, herring gull, gannet	All	MERP data have been used for Burbo Bank for kittiwake, herring gull and gannet. SeaMAST data have been used for Burbo Bank for great black-backed gull.
Burbo Bank Extension	Great black-backed gull	All	SeaMAST data have been used for Burbo Bank Extension for great black-backed gull.
Gwynt y Môr	Kittiwake, great black-backed gull, herring gull, gannet	All	MERP data have been used for Gwynt y Môr for kittiwake, herring gull and gannet. SeaMAST data have been used for Gwynt y Môr for great black-backed gull.
Robin Rigg	All	All	MERP data have been used for Robin Rigg for kittiwake, herring gull, lesser black-backed gull and gannet. SeaMAST data are used for Robin Rigg for great black-backed gull.
Walney 1 & 2 Offshore Wind Farm	Kittiwake, great black-backed gull, herring gull, gannet	All	MERP data are used for Walney 1 and 2 for kittiwake, herring gull and gannet. SeaMAST data are used for Walney 1 and 2 for great black-backed gull.
West of Duddon Sands	Kittiwake, great black-backed gull, herring gull, gannet	All	MERP data are used for West of Duddon Sands for kittiwake, herring gull and gannet. SeaMAST data are used for West of Duddon Sands for great black-backed gull.
West of Orkney	Herring gull, lesser black-backed gull	All	Species not considered. Species not included in collision risk modelling undertaken for assessments undertaken for the project due to negligible numbers of birds during baseline surveys.

Correction factors for flying birds (MERP)

2.2.2.7 The MERP dataset incorporates all bird behaviours (i.e. sitting and flying birds). Only birds in flight are at risk of collision and therefore correction of the densities obtained from the MERP dataset is required.

2.2.2.8 The MERP data were corrected by using the average number of birds flying as recorded in the Digital Aerial Surveys (DAS) undertaken to support the assessments for Mona, Morgan and Morecambe projects (Table 2.7) with data provided by each project. This was considered the best estimate to use as these recent surveys collectively cover a large proportion of the Irish Sea which is within close proximity of the projects for which analyses are being conducted. The Applicant also considers these surveys to be the most valid, as each DAS programme was undertaken over a period of two years. Baseline characterisation surveys for older projects often lack

appropriate sampling design and monthly coverage and, therefore, not considered as robust.

2.2.2.9 As advised during the meeting with NRW, the JNCC and Natural England on 29 August 2024, the Applicant has considered nearshore projects, specifically Awel y Môr, Burbo Bank Extension and Walney Extension. These projects being located in the eastern Irish Sea having used survey methods comparable to those undertaken for the Mona, Morgan and Morecambe projects.

2.2.2.10 Whilst the application documentation for Burbo Bank Extension and Walney Extension present information relating to the behaviour of birds during site-specific surveys, these data are not in a format to allow for direct comparison with the data available for the Mona, Morgan and Morecambe projects.

2.2.2.11 The average proportion of birds in flight for gannet during the site-specific surveys at Awel-y-Môr offshore wind farm was lower than the proportion recorded at both the Mona Offshore Wind Project and the Morgan Generation Assets and slightly higher than that recorded at the Morecambe Generation Assets. It was therefore lower than the average proportion of birds in flight calculated based on the data from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets. Whilst this may suggest a difference in the behaviour of birds at Awel-y-Môr offshore wind farm, the application of the average proportion calculated for the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets represents a precautionary approach which may potentially over-estimate collision risk estimates at projects closer to shore.

2.2.2.12 The proportion of kittiwake in flight recorded during site-specific surveys of the Awel-y-Môr offshore wind farm was slightly higher than the proportions recorded during surveys of the Mona Offshore Wind Project and Morgan Generation Assets. The proportion at the Morecambe Generation Assets was lower than the other three projects. The inclusion of the Awel-y-Môr offshore wind farm in the calculation of an average proportion of birds in flight would increase the average to 57.14% which is not considered to materially affect the collision risk estimates calculated in this report.

2.2.2.13 The proportion of herring gull in flight recorded during site-specific surveys of the Awel-y-Môr offshore wind farm was lower than the proportion of herring gull recorded in flight at the Mona Offshore Wind Project and Morgan Generation Assets and higher than the proportion recorded at the Morecambe Generation Assets. The average proportion at the Awel-y-Môr offshore wind farm was therefore also lower than the average proportion of birds in flight calculated based on the data from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets. Whilst this may suggest a difference in the behaviour of birds at Awel-y-Môr offshore wind farm, the application of the average proportion calculated for the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets represents a precautionary approach which may potentially over-estimate collision risk estimates at projects closer to shore.

2.2.2.14 The average percentage presented is the average of the three projects and not the percentage of the number of birds as Morecambe Generation presented abundance estimates and not raw count data and therefore the “total number of birds recorded” are not comparable across the projects.

2.2.2.15 All densities (without corrections for flying birds) used in collision risk modelling are presented in Appendix C. For clarity, the CRMs were run using the non-corrected densities and the average percentage of flying birds per species was applied to the CRM outputs.

Table 2.7: Percentage of birds recorded flying during aerial surveys for Mona, Morgan and Morecambe.

Species		Mona[1]	Morgan[2]	Morecambe[3]	Mona, Morgan and Morecambe average	Awel y Môr[4]
Gannet	Percentage flying (%)	45.35	48.81	26.88	**40.35**	27.76
	Number of birds flying	434	307	268	N/A	98
	Total number of birds recorded	957	629	997	N/A	353
Kittiwake	Percentage flying (%)	65.26	59.21	36.44	**53.64**	67.68
	Number of birds flying	2,262	1,832	1,750	N/A	377
	Total number of birds recorded	3,466	3,094	4,803	N/A	557
Lesser black-backed gull	Percentage flying (%)	61.82	57.43	61.22	**60.16**	N/A[5]
	Number of birds flying	34	58	90	N/A	N/A
	Total number of birds recorded	55	101	147	N/A	N/A
Herring gull	Percentage flying (%)	50.00	47.88	29.59	**42.49**	33.91
	Number of birds flying	36	158	87	N/A	39
	Total number of birds recorded	72	330	294	N/A	115

Footnotes

[1] Raw data associated with Mona DAS taken from Volume 6, Annex 5.1: Offshore Ornithology Baseline Characterisation Technical Report (Mona Offshore Wind Ltd, 2024)

[2] Raw data associated with Morgan DAS taken from Volume 5 - Appendix 12.1 - Offshore Ornithology Technical Report (APP-053)

[3] Proportion of birds in flight calculated using data from from Volume 4, Annex 5.1: Offshore ornithology baseline characterisation (Morecambe Offshore Windfarm, 2024)

[4] Raw data associated with Awel Y Môr DAS taken from Volume 4, Annex 4.1: Offshore Ornithology Baseline Characterisation Report (Awel Y Mor Offshore Wind Farm, 2022)

[5] Awel Y Môr DAS reported a very low number of lesser black-backed gull (five individuals throughout all surveys in the wind farm plus 4 km buffer) and therefore has not been included.

2.2.3 Modelling parameters

2.2.3.1 Wind farm parameters for additional projects (both as-built and consented parameters) were sourced from the MacArthur Green database (The Crown Estate, 2019). This database provides a summary of offshore ornithological collision risk modelling data for all UK offshore windfarms. Consented turbine parameters are not available for some projects and therefore as-built turbine parameters have been modelled. The parameters used for each project are presented in Table 2.8. Two scenarios are presented in the results section, one using consented scenarios where available and another using as-built scenarios only.

2.2.3.2 The Crown Estate (2019) database does not include some of the parameters required for modelling for the consented turbine scenarios for the Walney 1, Walney 2 and West of Duddon Sands offshore wind farms (namely hub height which is required to calculate air gap). As-built parameters for these projects were used and accepted by the regulators as part of the examination submissions for the Walney Extension Offshore Wind Farm relating to in-combination collision risk of lesser black-backed gull (Dong Energy, 2014). The Applicant has only presented as-built impacts for these two windfarms as this approach was accepted in the consenting of the Walney Extension Offshore Wind Farm. To adopt the consented parameters for constructed and operational projects is unrealistic and therefore unnecessarily precautionary.

Table 2.8: Wind farm parameters used within the CRMs for the historical projects gap-filling.

Project	Consented or as-built	Number of turbines	Turbine capacity (mw)	Hub height (m from HAT)	Rotor radius (m)	Rotor speed (rpm)	Maximum blade width (m)	Blade pitch (°)	Proportion of time operational (%)	Tidal offset (m)	Latitude (decimal degrees)	Width (km)
Burbo Bank	Consent	30	3	74	45	16.1	3.5	6	94	4	53.48	5.3
	As-built	25	3.6	79.5	53.5	13	4.2	15	94	4	53.48	5.3
Burbo Bank Extension	Consent	69	3.6	81	60	13	4.2	6	94	4	53.48	13.4
	As-built	32	8	103	82	10.5	5.4	15	94	4	53.48	13.4
Gwynt y Môr	Consent	250	3	67.5	45	16.1	3.6	15	94	4	53.45	15.2
	As-built	160	3.6	94	53.5	13	4.2	15	94	4	53.45	15.2
Robin Rigg	Consented	Parameters not available in The Crown Estate (2019).										
	As-built	60	3	76	45	16.1	3.5	15	94	4	54.75	6.01
Walney 1 Offshore Wind Farm	Consented	Parameters not available in The Crown Estate (2019) however, there is precedent for the use of as-built parameters (Dong Energy, 2014).										
	As-built	51	3.6	78.5 to 86	53.5	13	4.2	15	94	4	54.03	7.8
Walney 2 Offshore Wind Farm	Consented	Parameters not available in The Crown Estate (2019) however, there is precedent for the use of as-built parameters (Dong Energy, 2014).										
	As-built	51	3.6	78.5 to 86	60	13	4.2	15	94	4	54.08	8.9
West of Duddon Sands	Consented	Parameters not available in The Crown Estate (2019) however, there is precedent for the use of as-built parameters (Dong Energy, 2014).										
	As-built	108	3.6	86	60	13	4.2	15	94	4	53.98	11.9

2.2.4 Avoidance rates

2.2.4.1 The avoidance rates used reflect those presented in the cumulative assessments in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the in-combination assessments presented in the HRA Stage 2 ISAA Part Three: Special Protection Areas and Ramsar sites Assessments (APP-098). These reflect the Applicant's and SNCB positions. More specifically the avoidance rates applied reflect the species group and species-specific avoidance rates as presented in Ozsanlav-Harris *et al.* (2023) (Table 2.9).

Table 2.9: Avoidance rates used within the collision risk assessment for historical projects.

Project	Species group avoidance rate (%)	Species-specific avoidance rate (%)
Kittiwake	0.9928 (gull rate)	0.9979
Great black-backed gull	0.9939 (large gull rate)	0.9991
Herring gull	0.9939 (large gull rate)	0.9928
Lesser black-backed gull	0.9939 (large gull rate)	0.9954
Gannet	0.9928 (gull rate)	0.9928

2.2.5 Collision risk model

2.2.5.1 Collision risk modelling was undertaken using the stochastic CRM (sCRM) developed by Marine Scotland (McGregor *et al.*, 2018). Collision risk models were run deterministically as there was no variation metric available for the density estimates or wind farm and turbine parameters and therefore a stochastic CRM could not be run, using Band Option 2 of the sCRM. The proportion of birds flying at collision risk height was determined using generic flight height data (Johnston *et al.*, 2014) rather than site-based data.

2.2.6 Assessment approach

2.2.6.1 The total in-combination collision risk estimate is considered on an annual basis against the baseline mortality for the relevant reference population. The increase in background mortality from the predicted impact (from both the original cumulative and in-combination assessments in both Volume 2, Chapter 5: Offshore ornithology (APP-023) or HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and the cumulative and in-combination assessments presented in this report) is then compared. As stated in paragraph 2.1.4.2, where the change in baseline mortality is considered to be material (i.e. would lead to a change in the assessment conclusions reached in either Volume 2, Chapter 5: Offshore ornithology (APP-023) or HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)) then further consideration of the associated impact is provided in the relevant section. If the change is not considered to be material in assessment terms then the assessment conclusions reached in

Volume 2, Chapter 5: Offshore ornithology (APP-023) or HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) are considered to remain valid. In addition, consideration is given to a range of other impact scenarios, applying different modelling parameters to determine how the inclusion of additional projects would influence the assessment process.

3 RESULTS

3.1 Displacement during operation and maintenance

3.1.1 EIA basis

Kittiwake

3.1.1.1 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to operational displacement impacts on kittiwake has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.1). In all seasons the difference in the effect on baseline mortality represents less than 0.01%.

3.1.1.2 Full results, detailing the individual impacts for each project are presented in A.1.1 in Appendix A.

Table 3.1: Change in baseline mortality (%) associated with displacement during the operations and maintenance phase for kittiwake.

	Effect on baseline mortality (%) using evidence-based 50% displacement and 1% mortality rates (And for range, 30-70% & 1-2% respectively)			
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**
Cumulative Effects Assessment Environmental Statement	0.09 (0.06 to 0.27)	0.03 (0.02 to 0.08)	0.03 (0.02 to 0.08)	0.07 (0.04 to 0.21)
Cumulative Effects Assessment including additional projects	0.10 (0.06 to 0.27)	0.03 (0.02 to 0.09)	0.03 (0.02 to 0.08)	0.08 (0.05 to 0.22)
Difference in baseline mortality	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to 0.01)**	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to 0.01)**

3.1.1.3 Based on the difference in the effect on baseline mortality between the cumulative impact predicted with and without additional projects (Table 3.1), it is concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Guillemot

3.1.1.4 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to operational displacement impacts on guillemot has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.2). In all seasons the difference in the effect on baseline mortality represents less than 0.01%.

3.1.1.5 Full results, detailing the individual impacts for each project are presented in A.1.2 in Appendix A.

Table 3.2: Effect on baseline mortality associated with displacement during the operations and maintenance phase for guillemot.

	Effect on baseline mortality (%) using evidence-based 50% displacement and 1% mortality rates (And for range, 30-70% & 1-2% respectively)		
	Breeding	**Non-breeding**	**Annual**
CEA Environmental Statement	0.13 (0.08 to 0.37)	0.18 (0.11 to 0.52)	0.31 (0.19 to 0.88)
CEA including additional projects	0.13 (0.08 to 0.37)	0.19 (0.11 to 0.52)	0.32 (0.19 to 0.89)
Difference in baseline mortality	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to 0.01)**	**<0.01 (<0.01 to 0.01)**

3.1.1.6 Based on the difference in the effect on baseline mortality between the cumulative impact predicted with and without additional projects (Table 3.2), it is concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Razorbill

3.1.1.7 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to operational displacement impacts on razorbill has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.3). In all seasons the difference in the effect on baseline mortality represents less than 0.01%.

3.1.1.8 Full results, detailing the individual impacts for each project are presented in A.1.3 in Appendix A.

Table 3.3: Effect on baseline mortality associated with displacement during the operations and maintenance phase for razorbill.

	Effect on baseline mortality (%) using evidence-based 50% displacement and 1% mortality rates (And for range, 30-70% & 1-2% respectively)				
	Breeding	**Post-breeding**	**Non-breeding**	**Pre-breeding**	**Annual**
CEA Environmental Statement	0.02 (0.01 to 0.05)	0.02 (0.01 to 0.05)	0.06 (0.04 to 0.17)	0.02 (0.01 to 0.06)	0.08 (0.05 to 0.22)
CEA including additional projects	0.02 (0.01 to 0.05)	0.02 (0.01 to 0.05)	0.06 (0.04 to 0.86)	0.02 (0.01 to 0.06)	0.08 (0.05 to 0.23)
Difference in baseline mortality	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to 0.01)**

3.1.1.9 Based on the difference in the effect on baseline mortality between the cumulative impact predicted with and without additional projects (Table 3.3), it is concluded that

the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Manx shearwater

3.1.1.10 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to operational displacement impacts on Manx shearwater has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.4). In all seasons the difference in the effect on baseline mortality represents less than 0.01%.

3.1.1.11 Full results, detailing the individual impacts for each project are presented in A.1.4 in Appendix A.

Table 3.4: Effect on baseline mortality associated with displacement during the operations and maintenance phase for Manx shearwater.

	Effect on baseline mortality (%) using evidence-based 50% displacement and 1% mortality rates (and for range, 30-70% & 1-2% respectively)			
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**
CEA Environmental Statement	0.06 (0.04 to 0.16)	0.01 (<0.01 to 0.02)	<0.01 (<0.01 to <0.01)	0.06 (0.04 to 0.18)
CEA including additional projects	0.06 (0.04 to 0.16)	0.01 (<0.01 to 0.02)	<0.01 (<0.01 to <0.01)	0.06 (0.04 to 0.18)
Difference in baseline mortality	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to <0.01)**	**<0.01 (<0.01 to <0.01)**

3.1.1.12 Based on the difference in the effect on baseline mortality between the cumulative impact predicted with and without additional projects (Table 3.4), it is concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Gannet

3.1.1.13 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to operational displacement impacts on gannet has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.5). In all seasons the difference in the effect on baseline mortality represents 0.01 to 0.02%.

3.1.1.14 Full results, detailing the individual impacts for each project are presented in A.1.5 in Appendix A.

Table 3.5: Effect on baseline mortality associated with displacement during the operations and maintenance phase for gannet.

	Effect on baseline mortality (%) using 70% displacement and 1% mortality rates			
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**
CEA Environmental Statement	0.03	0.02	<0.01	0.05
CEA including additional projects	0.02	0.02	<0.01	0.05
Difference in baseline mortality	**0.01**	**0.01**	**<0.01**	**0.02**

3.1.1.15 Based on the difference in the effect on baseline mortality between the cumulative impact predicted with and without additional projects (Table 3.5), it is concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

3.1.2 HRA basis

3.1.2.1 In-combination assessments were required for the following SPAs and features in relation to displacement impacts during the operations and maintenance phase in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098):

- Step 1:
  - Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA
  - Kittiwake at the Cape Wrath SPA
- Step 2:
  - Guillemot at the Flannan Isles SPA

3.1.2.2 The impact of including the quantified estimates calculated for additional projects in this report are considered in this section. Consideration is only given to Scenario 3 of the in-combination assessment as all other scenarios considered in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) did not include the projects for which quantified estimates have been calculated in this report.

Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA

3.1.2.3 The in-combination impact on the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA was considered as part of Step 1 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the combined collision and displacement impact for the Morgan Generation Assets alone exceeded a 0.05% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the seasonal in-combination apportioned abundance values for use in displacement analyses.

3.1.2.4 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the kittiwake population at the Ireland's Eye SPA and North-west Irish Sea SPA is 121.3 birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.6.

Table 3.6: Effect on baseline mortality (%) for the kittiwake population of the Ireland's Eye SPA and North-west Irish Sea SPA associated with displacement during the operations and maintenance phase.

	Effect on baseline mortality (%)		
	30% displacement rate / 1% mortality rate	**50% displacement rate / 1% mortality rate**	**70% displacement rate / 2% mortality rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	0.26	0.44	1.22
Impact including additional projects	0.27	0.46	1.28
Difference in assessment terms	**None – SPA not progressed to Step 2**	**None – SPA not progressed to Step 2**	**None – SPA progressed to Step 2**

3.1.2.5 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. Based on the Applicant's preferred displacement and mortality rates, HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA did not require further consideration in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to displacement impacts in the operations and maintenance phase as the predicted impact represented less than a 1% increase in the baseline mortality threshold.

3.1.2.6 The use of higher displacement and mortality rates consistent with those applied by the Secretary of State in the HRA for Hornsea Four and the Sheringham Shoal and Dudgeon Extension projects suggests that the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA should be considered in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). The inclusion of additional projects in the in-combination assessment does not change this conclusion. The assessment implications associated with the use of these rates is provided in the Displacement Rates Clarification Note submitted into the Examination at Deadline 1 (S_D1_4.6).

Kittiwake at the Cape Wrath SPA

3.1.2.7 The in-combination impact on the kittiwake feature of Cape Wrath SPA was considered as part of Step 1 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the

combined collision and displacement impact for the Morgan Generation Assets alone exceeded a 0.05% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report.

3.1.2.8 Appendix A presents the seasonal in-combination apportioned abundance values for use in displacement analyses.

3.1.2.9 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the kittiwake population at the Cape Wrath SPA is 431.5 birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.7.

Table 3.7: Effect on baseline mortality (%) for the kittiwake population of the Cape Wrath SPA associated with displacement during the operations and maintenance phase.

	Effect on baseline mortality (%)		
	30% displacement rate / 1% mortality rate	**50% displacement rate / 1% mortality rate**	**70% displacement rate / 2% mortality rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	0.12	0.19	0.54
Impact including additional projects	0.12	0.20	0.57
Difference in assessment terms	**None – SPA not progressed to Step 2**	**None – SPA not progressed to Step 2**	**None – SPA not progressed to Step 2**

3.1.2.10 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that the kittiwake feature of the Cape Wrath SPA did not require further consideration in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to displacement impacts in the operations and maintenance phase as the predicted impact represented less than a 1% increase in the baseline mortality threshold. This conclusion remains valid for all displacement and mortality rate scenarios.

Guillemot at the Flannan Isles SPA

3.1.2.11 The guillemot feature of the Flannan Isles SPA was progressed to Step 2 HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the

seasonal in-combination apportioned abundance values for use in displacement analyses.

3.1.2.12 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the guillemot population at the Flannan Isles SPA is 923.1 birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.8.

Table 3.8: Effect on baseline mortality (%) for the guillemot population of the Flannan Isles SPAs associated with displacement during the operations and maintenance phase.

	Effect on baseline mortality (%)		
	30% displacement rate / 1% mortality rate	**50% displacement rate / 1% mortality rate**	**70% displacement rate / 2% mortality rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	0.64	1.03	2.81
Impact including additional projects	0.65	1.05	2.85
Difference in baseline mortality	**0.01**	**0.01**	**0.04**

3.1.2.13 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that there was no adverse effect on the guillemot feature of the Flannan Isles SPA due to displacement impacts in the operations and maintenance phase. This conclusion remains valid for all displacement and mortality rate scenarios.

3.2 Collision

3.2.1 EIA basis

Kittiwake

3.2.1.1 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to collision impacts on kittiwake has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.9).

3.2.1.2 Full results, detailing the individual impacts for each project are presented in A.2.1 in Appendix A.

Table 3.9: Effect on baseline mortality associated with collision impacts for kittiwake.

	Windfarm parameters	Annual effect on baseline mortality (%)	
		Collision total using a 99.28% avoidance rate	Collision total using a 99.79% avoidance rate
Cumulative Effects Assessment Environmental Statement	-	0.36	0.10
Cumulative Effects Assessment including additional projects	Consented, where available	0.40	0.11
	All as-built	0.38	0.11
Difference in baseline mortality	Consented, where available	0.04	0.01
	All as-built	0.02	0.01

3.2.1.3 The effect on baseline mortality between the cumulative assessment in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the cumulative impact incorporating additional projects is 0.01% (Table 3.9). It is therefore concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Great black-backed gull

3.2.1.4 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to collision impacts on great black-backed gull has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.10).

3.2.1.5 Full results, detailing the individual impacts for each project are presented in A.2.2 in Appendix A.

Table 3.10: Effect on baseline mortality associated with collision impacts for great black-backed gull.

	Windfarm parameters	Annual effect on baseline mortality (%)	
		Collision total using a 99.39% avoidance rate	Collision total using a 99.91% avoidance rate
CEA Environmental Statement	-	2.87	0.42
CEA including additional projects	Consented, where available	3.83	0.56
	All as-built	3.56	0.52
Difference in baseline mortality	Consented, where available	0.96	0.14
	All as-built	0.71	0.11

3.2.1.6 The effect on baseline mortality between the cumulative assessment in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the cumulative impact incorporating additional projects is 0.11-0.14% (Table 3.10). This increase does not result in the

predicted impact surpassing the 1% threshold of baseline mortality and it is therefore concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Herring gull

3.2.1.7 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to collision impacts on herring gull has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.11).

3.2.1.8 Full results, detailing the individual impacts for each project are presented in A.2.3 in Appendix A.

Table 3.11: Effect on baseline mortality associated with collision impacts for herring gull.

	Windfarm parameters	Annual effect on baseline mortality (%)	
		Collision total using a 99.39% avoidance rate	Collision total using a 99.52% avoidance rate
CEA Environmental Statement	-	0.41	0.32
CEA including additional projects	Consented, where available	0.74	0.58
	All as-built	0.66	0.52
Difference in baseline mortality	Consented, where available	0.34	0.26
	All as-built	0.26	0.20

3.2.1.9 The effect on baseline mortality between the cumulative assessment in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the cumulative impact incorporating additional projects is 0.20-0.26% (Table 3.11). This increase does not result in the predicted impact surpassing the 1% threshold of baseline mortality and it is therefore concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Lesser black-backed gull

3.2.1.10 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to collision impacts on lesser black-backed gull has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.12). The only project that requires consideration is Robin Rigg for which only as-built parameters are available.

3.2.1.11 Full results, detailing the individual impacts for each project are presented in A.2.4 in Appendix A.

Table 3.12: Effect on baseline mortality associated with collision impacts for lesser black-backed gull.

	Windfarm parameters	Annual effect on baseline mortality (%)	
		Collision total using a 99.39% avoidance rate	Collision total using a 99.54% avoidance rate
CEA Environmental Statement	-	0.97	0.73
CEA including additional projects	As-built	0.99	0.74
Difference in baseline mortality	As-built	0.02	0.01

3.2.1.12 The effect on baseline mortality between the cumulative assessment in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the cumulative impact incorporating additional projects is 0.01% (Table 3.12). It is therefore concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

Gannet

3.2.1.13 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to collision impacts on gannet has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.13).

3.2.1.14 Full results, detailing the individual impacts for each project are presented in A.2.5 in Appendix A.

Table 3.13: Effect on baseline mortality associated with collision impacts for gannet.

	Windfarm parameters	Annual effect on baseline mortality (%) (Collision total using a 99.28% avoidance rate)
CEA	-	0.14
CEA including additional projects	Consented, where available	0.15
	All as-built	0.14
Difference in baseline mortality	Consented, where available	0.01
	All as-built	0.01

3.2.1.15 The effect on baseline mortality between the cumulative assessment in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the cumulative impact incorporating additional projects is 0.01% (Table 3.13). It is therefore concluded that the inclusion of the additional projects has no effect on the conclusions of the cumulative assessment presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) which concluded an impact of negligible significance.

3.2.2 HRA basis

3.2.2.1 In-combination assessments were required for the following SPAs and features in relation to displacement impacts during the operations and maintenance phase in HRA

Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098):

- Step 2:
  - Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA
  - Kittiwake at the Cape Wrath SPA
  - Great black-backed gull at the Isles of Scilly SPA
  - Herring gull and the Morecambe Bay and Duddon Estuary SPA

3.2.2.2 The impact of including the quantified estimates calculated for additional projects in this report are considered in this section. Consideration is only given to Scenario 3 of the in-combination assessment as all other scenarios considered in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) did not include the projects for which quantified estimates have been calculated in this report. Scenario 2 included only the Morgan Generation and Morecambe Generation Assets, for which estimates are available. Scenario 1 included the Morgan Generation Assets and Morgan and Morecambe Transmission Assets for which this issue does not apply as collision and displacement are not relevant to the Transmission Assets.

Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA

3.2.2.3 The kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the seasonal in-combination apportioned collision risk estimates for all projects.

3.2.2.4 The total in-combination impact on the kittiwake population at the Ireland's Eye SPA and North-west Irish Sea SPA is 0.6 to 2.0 birds/annum birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.14.

Table 3.14: Effect on baseline mortality (%) for the kittiwake population of the Ireland's Eye SPA and North-west Irish Sea SPA associated with collision during the operations and maintenance phase.

	Effect on baseline mortality (%)	
	99.28% avoidance rate	**99.79% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	1.24	0.36
Impact including additional projects	1.51	0.44
Difference in baseline mortality	0.26	0.08

3.2.2.5 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA did not require further consideration in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to collision impacts in the operations and maintenance phase as the predicted impact represented less than a 1% increase in the baseline mortality threshold. This conclusion remains valid for all avoidance rates.

3.2.2.6 Table 3.15 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller than predicted in Table 3.14 and therefore the conclusions reached above remain valid for all avoidance rates.

Table 3.15: Effect on baseline mortality (%) for the kittiwake population of the Ireland's Eye SPA and North-west Irish Sea SPA associated with collision during the operations and maintenance phase when using as-built parameters.

	Effect on baseline mortality (%)	
	99.28% avoidance rate	**99.79% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	1.24	0.36
Impact including additional projects	1.41	0.41
Difference in baseline mortality	**0.16**	**0.05**

Kittiwake at the Cape Wrath SPA

3.2.2.7 The kittiwake feature of the Cape Wrath SPA was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the seasonal in-combination apportioned collision risk estimates for all projects.

3.2.2.8 The total in-combination impact on the kittiwake population at the Ireland's Eye SPA and North-west Irish Sea SPA is 3.4 to 11.5 birds/annum birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.16.

Table 3.16: Effect on baseline mortality (%) for the kittiwake population of the Cape Wrath SPA associated with collision during the operations and maintenance phase.

	Effect on baseline mortality (%)	
	99.28% avoidance rate	**99.79% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	1.02	0.30
Impact including additional projects	1.09	0.32
Difference in baseline mortality	**0.07**	**0.02**

3.2.2.9 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that the kittiwake feature of the Cape Wrath SPA did not require further consideration in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to collision impacts in the operations and maintenance phase as the predicted impact represented less than a 1% increase in the baseline mortality threshold. This conclusion remains valid for all avoidance rates.

3.2.2.10 Table 3.17 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller than predicted in Table 3.16 and therefore the conclusions reached above remain valid for all avoidance rates.

Table 3.17: Effect on baseline mortality (%) for the kittiwake population of the Cape Wrath SPA associated with collision during the operations and maintenance phase when using as-built parameters.

	Effect on baseline mortality (%)	
	99.28% avoidance rate	**99.79% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	1.02	0.30
Impact including additional projects	1.06	0.32
Difference in baseline mortality	**0.04**	**0.01**

Great black-backed gull at the Isles of Scilly SPA

3.2.2.11 The great black-backed gull feature of the Isles of Scilly SPA was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the seasonal in-combination apportioned collision risk estimates for all projects.

3.2.2.12 The total in-combination impact on the great black-backed gull population at the Isles of Scilly SPA is 1.5 to 10.4 birds/annum birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.18.

Table 3.18: Effect on baseline mortality (%) for the great black-backed gull population of the Isles of Scilly SPA associated with collision during the operations and maintenance phase.

	Effect on baseline mortality (%)	
	99.39% avoidance rate	**99.91% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	7.80	1.14
Impact including additional projects	9.19	1.35
Difference in baseline mortality	**1.39**	**0.20**

3.2.2.13 The difference in the effect on baseline mortality between the in-combination impact predicted with and without additional projects (Table 3.18) is considered to represent a material difference in the baseline mortality metric. However, other aspects of the assessment means this increase is inconsequential.

3.2.2.14 HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that there was no adverse effect on the integrity of the Isles of Scilly SPA as a result of in-combination collision impacts on great black-backed gull and this conclusion remains valid for all avoidance rates. For example, as discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), the apportioning values calculated in the non-breeding season utilise population data from Furness (2015) and assume that birds from SPAs of relevance to a BDMPS area are equally distributed throughout the BDMPS. Projects in the Irish Sea are located close to the boundary between the South-west and Channel BDMPS and West of Scotland BDMPS. The South-west and Channel BDMPS is considered to contain 90% of the great black-backed gull population from the Isles of Scilly in the non-breeding season however, no great black-backed gulls from the Isles of Scilly are considered to be present in the West of Scotland BDMPS in the same period. Ring recovery information presented in Wernham *et al.* (2002) suggests limited connectivity between birds breeding in the south-west of England and the Irish Sea. Breeding great black-backed gulls in the UK are predominantly

sedentary and are rarely found far from breeding locations. Immature great black-backed gulls disperse further than adult birds. The median distance moved by adult birds is 54.5 km, suggesting no connectivity between the Isles of Scilly and the Irish Sea, whilst for immature birds the median distance is 115 km (Wernham *et al.*, 2002). It is therefore considered highly likely that projects located in the Irish Sea do not contribute to in-combination impacts on the great black-backed gull population of the Isles of Scilly SPA.

3.2.2.15 Table 3.19 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller than predicted in Table 3.18 and therefore the conclusions reached, that there was no adverse effect on the integrity of the Isles of Scilly SPA as a result of in-combination collision impacts on great black-backed gull, remain valid for all avoidance rates.

Table 3.19: Effect on baseline mortality (%) for the great black-backed gull population of the Isles of Scilly SPA associated with collision during the operations and maintenance phase when using as-built parameters.

	Effect on baseline mortality (%)	
	99.39% avoidance rate	**99.91% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	7.80	1.14
Impact including additional projects	8.82	1.29
Difference in baseline mortality	**1.02**	**0.15**

Herring gull and the Morecambe Bay and Duddon Estuary SPA

3.2.2.16 The herring gull feature of the Morecambe Bay and Duddon Estuary SPA was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the seasonal in-combination apportioned abundance values for use in displacement analyses.

3.2.2.17 The total in-combination impact on the herring gull population at the Morecambe Bay and Duddon Estuary SPA is 34.5 to 44.1 birds/annum birds. The impact this has on the assessment presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.20.

Table 3.20: Effect on baseline mortality (%) for the herring gull population of the Morecambe Bay and Duddon Estuary SPA associated with collision during the operations and maintenance phase.

	Effect on baseline mortality (%)	
	99.39% avoidance rate	**99.52% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	7.57	5.90
Impact including additional projects	16.95	13.28
Difference in baseline mortality	**9.38**	**7.38**

3.2.2.18 The difference in the effect on baseline mortality between the in-combination impact predicted with and without additional projects (Table 3.18) is considered represent a material difference in the baseline mortality metric. However, other aspects of the assessment (e.g. a lack of connectivity between herring gulls from the Morecambe Bay and Duddon Estuary SPA and the marine environment) means this increase is inconsequential. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that there was no adverse effect on the integrity of the Morecambe Bay and Duddon Estuary SPA as a result of in-combination collision impacts on herring gull and this conclusion remains valid for all avoidance rates.

3.2.2.19 Table 3.21 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller than predicted in Table 3.20 and therefore the conclusions reached, that there was no adverse effect on the integrity of the Morecambe Bay and Duddon Estuary SPA as a result of in-combination collision impacts on herring gull, remain valid for all avoidance rates.

Table 3.21: Effect on baseline mortality (%) for the herring gull population of the Morecambe Bay and Duddon Estuary SPA associated with collision during the operations and maintenance phase when using as-built parameters.

	Effect on baseline mortality (%)	
	99.39% avoidance rate	**99.52% avoidance rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	7.57	5.90
Impact including additional projects	16.48	12.92
Difference in baseline mortality	**8.92**	**7.02**

3.3 Displacement and collision combined

3.3.1 EIA basis

Kittiwake

3.3.1.1 The effect on baseline mortality as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023) due to the combined impact of displacement and collision on kittiwake has been compared to the effect on baseline mortality as a result of including the additional projects for which impacts have been estimated in this note in the cumulative assessment (Table 3.22).

3.3.1.2 Full results, detailing the individual impacts for each project are presented in A.1.1 and A.2.1 in Appendix A.

Table 3.22: Effect on baseline mortality associated with combined displacement and collision impacts for kittiwake.

Species	70% displacement rate / 1% mortality rate	50% displacement rate / 1% mortality rate	70% displacement rate / 2% mortality rate
Cumulative Effects Assessment			
% effect on baseline mortality	0.15 (0.41)	0.18 (0.44)	0.32 (0.57)
Cumulative Effects Assessment including additional projects			
% effect on baseline mortality	0.16 (0.45)	0.19 (0.48)	0.34 (0.62)
Comparison			
Difference in baseline mortality	0.01 (0.04)	0.01 (0.04)	0.02 (0.05)

Gannet

3.3.1.3 The effect on baseline mortality due to the combined impact of displacement and collision on gannet (as predicted in Volume 2, Chapter 5: Offshore ornithology (APP-023)) has been compared to the effect on baseline mortality as a result of including the additional projects, for which impacts have been estimated, in this note in the cumulative assessment (Table 3.23).

3.3.1.4 The full results, detailing the individual impacts for each project are presented in A.1.5 and A.2.5 in Appendix A.

Table 3.23: Effect on baseline mortality associated with combined displacement and collision impacts for gannet.

Species	70% displacement rate / 1% mortality rate
Cumulative Effects Assessment	
% effect on baseline mortality	0.19
Cumulative Effects Assessment including additional projects	
% effect on baseline mortality	0.20
Comparison	
Difference in baseline mortality	0.01

3.3.2 HRA basis

3.3.2.1 In-combination assessments were required for the following SPAs and features in relation to displacement impacts during the operations and maintenance phase in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098):

- Step 1:
  - Kittiwake at the Howth Head Coast SPA
- Step 2:
  - Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA
  - Kittiwake at the Cape Wrath SPA

3.3.2.2 The impact of including the quantified estimates calculated for additional projects in this report are considered in this section. For Step 2, consideration is only given to Scenario 3 of the in-combination assessment as all other scenarios considered in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) did not include the projects for which quantified estimates have been calculated in this report.

Kittiwake at the Howth Head Coast SPA

3.3.2.3 The in-combination impact on the kittiwake feature of Howth Head Coast SPA was considered as part of Step 1 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the combined collision and displacement impact for the Morgan Generation Assets alone exceeded a 0.05% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Appendix A presents the seasonal in-combination apportioned abundance values for use in displacement analyses.

3.3.2.4 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the kittiwake population at the Howth Head Coast SPA is 187.2 birds. The impact this has on the assessment presented in HRA Stage 2 information

to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) is provided in Table 3.24.

Table 3.24: Effect on baseline mortality (%) for the kittiwake population of the Howth Head Coast SPA associated with displacement and collision during the operations and maintenance phase.

	Effect on baseline mortality (%)		
	Collision + 30% displacement rate / 1% mortality rate	**Collision + 50% displacement rate / 1% mortality rate**	**Collision + 70% displacement rate / 2% mortality rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	0.63	0.70	1.01
Impact including additional projects	0.74	0.81	1.14
Difference in assessment terms	**None – SPA not progressed to Step 2**	**None – SPA not progressed to Step 2**	**None – SPA progressed to Step 2**

3.3.2.5 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA did not require further consideration in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to combined displacement and collision impacts in the operations and maintenance phase as the predicted impact represented less than a 1% increase in the baseline mortality threshold. This conclusion remains valid when applying the Applicant's preferred displacement and mortality rates.

3.3.2.6 The use of higher displacement and mortality rates consistent with those applied by the Secretary of State in the HRA for Hornsea Four and the Sheringham Shoal and Dudgeon Extension projects suggests that the kittiwake feature of the Howth Head Coast SPA should be considered in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). The inclusion of additional projects in the in-combination assessment does not change this conclusion. The assessment implications associated with the use of these rates is provided in the Displacement Rates Clarification Note submitted into the Examination at Deadline 1 (S_D1_4.6).

3.3.2.7 Table 3.25 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller

than predicted in Table 3.24 and therefore the conclusions reached above remain valid when applying the Applicant's preferred displacement and mortality rates.

Table 3.25: Effect on baseline mortality (%) for the kittiwake population of Howth Head Coast SPA associated with displacement and collision during the operations and maintenance phase when using as-built parameters.

	Effect on baseline mortality (%)		
	Collision + 30% displacement rate / 1% mortality rate	**Collision + 50% displacement rate / 1% mortality rate**	**Collision + 70% displacement rate / 2% mortality rate**
HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	0.63	0.70	1.01
Impact including additional projects	0.70	0.77	1.10
Difference in assessment terms	**None – SPA not progressed to Step 2**	**None – SPA not progressed to Step 2**	**None – SPA progressed to Step 2**

Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA

3.3.2.8 The kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Table 3.26 presents the effect on baseline mortality for both the ISAA assessment and the assessment conducted in this report.

Table 3.26: Effect on baseline mortality (%) for the kittiwake population of the Ireland's Eye SPA and North-west Irish Sea SPA associated with displacement and collision during the operations and maintenance phase when using consented turbine parameters, where available.

Species	30% displacement rate / 1% mortality rate	50% displacement rate / 1% mortality rate	70% displacement rate / 2% mortality rate
ISAA			
% effect on baseline mortality	0.62 (1.51)	0.80 (1.69)	1.58 (2.47)
ISAA plus additional projects			
% effect on baseline mortality	0.71 (1.79)	0.89 (1.97)	1.71 (2.79)
Comparison			
Difference in baseline mortality	**0.09 (0.28)**	**0.10 (0.28)**	**0.13 (0.32)**

3.3.2.9 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that there was no adverse effect on the integrity of the Ireland's Eye SPA and North-west Irish Sea SPA as a result of in-combination displacement and collision impacts on kittiwake and this conclusion remains valid when applying the Applicant's preferred displacement and mortality rates.

3.3.2.10 The use of higher displacement and mortality rates consistent with those applied by the Secretary of State in the HRA for Hornsea Four and the Sheringham Shoal and Dudgeon Extension projects suggests that the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA should be considered in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). The inclusion of additional projects in the in-combination assessment does not change this conclusion. However, it is important to note that kittiwake is not considered vulnerable to displacement impacts (Wade *et al.,* 2016; JNCC *et al.,* 2022) and has not been considered as such in the assessments presented for previous projects in English waters or by the Secretary of State. Kittiwake has been assessed in relation to displacement impacts associated with the Morgan Generation Assets at the request of JNCC. The assessment implications associated with the use of these rates is provided in the Displacement Rates Clarification Note submitted into the Examination at Deadline 1 (S-D1-3.5).

3.3.2.11 Table 3.27 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller than predicted in Table 3.26 and therefore the conclusions reached above remain valid when applying the Applicant's preferred displacement and mortality rates.

Table 3.27: Effect on baseline mortality (%) for the kittiwake population of the Ireland's Eye SPA and North-west Irish Sea SPA associated with displacement and collision during the operations and maintenance phase when using as-built turbine parameters.

Species	30% displacement rate / 1% mortality rate	50% displacement rate / 1% mortality rate	70% displacement rate / 2% mortality rate
ISAA			
% effect on baseline mortality	0.62 (1.51)	0.80 (1.69)	1.58 (2.47)
ISAA plus additional projects			
% effect on baseline mortality	0.68 (1.69)	0.86 (1.87)	1.68 (2.69)
Comparison			

Species	30% displacement rate / 1% mortality rate	50% displacement rate / 1% mortality rate	70% displacement rate / 2% mortality rate
Difference in baseline mortality	**0.06 (0.17)**	**0.07 (0.18)**	**0.10 (0.22)**

Kittiwake at the Cape Wrath SPA

3.3.2.12 The kittiwake feature of the Cape Wrath SPA was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted in-combination impact exceeded a 1% increase in the baseline mortality of the SPA population. This assessment is repeated in this section incorporating the additional projects for which quantitative estimates have been calculated in this report. Table 3.28 presents the effect on baseline mortality for both the ISAA assessment and the assessment conducted in this report.

Table 3.28: Effect on baseline mortality (%) for the kittiwake population of the Cape Wrath SPA associated with displacement and collision during the operations and maintenance phase when using consented turbine parameters, where available.

Species	30% displacement rate / 1% mortality rate	50% displacement rate / 1% mortality rate	70% displacement rate / 2% mortality rate
ISAA assessment			
% effect on baseline mortality	0.42 (1.14)	0.50 (1.22)	0.85 (1.57)
ISAA plus additional projects			
% effect on baseline mortality	0.45 (1.21)	0.53 (1.29)	0.90 (1.66)
Comparison			
Difference in baseline mortality	**0.02 (0.07)**	**0.03 (0.07)**	**0.05 (0.09)**

3.3.2.13 The difference in the effect on baseline mortality with and without additional projects is not considered to be material and it is therefore concluded that the inclusion of additional projects would have no effect on the conclusions of any subsequent assessment. HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) concluded that there was no adverse effect on the integrity of the Cape Wrath SPA as a result of in-combination displacement and collision impacts on kittiwake and this conclusion remains valid across all displacement and mortality rate scenarios.

3.3.2.14 Table 3.29 compares the baseline mortality predicted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) to the impact estimated when including additional projects using as-built parameters. The calculation of the total in-combination impact is provided in Appendix A. When including as-built parameters for all wind farms the resulting effect on baseline mortality is lower, albeit still higher than that predicted in

HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This difference is smaller than predicted in Table 3.28 and therefore the conclusions reached above remain valid across all displacement and mortality rate scenarios.

Table 3.29: Effect on baseline mortality (%) for the kittiwake population of the Cape Wrath SPA associated with displacement and collision during the operations and maintenance phase when using as-built parameters.

Species	30% displacement rate / 1% mortality rate	50% displacement rate / 1% mortality rate	70% displacement rate / 2% mortality rate
ISAA			
% effect on baseline mortality	0.42 (1.14)	0.50 (1.22)	0.85 (1.57)
ISAA plus additional projects			
% effect on baseline mortality	0.44 (1.18)	0.52 (1.27)	0.89 (1.63)
Comparison			
Difference in baseline mortality	0.02 (0.04)	0.02 (0.05)	0.04 (0.07)

4 DISCUSSION

4.1 Methodology

4.1.1.1 The method applied in this note follows the method recommended by the EWG as part of the Evidence Plan process. It utilises data from the MERP dataset to calculate indicative estimates for currently unquantified impacts which have been considered qualitatively in the assessments presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) and HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This has provided indicative estimates for all relevant projects, species and impacts as requested by the EWG.

4.1.1.2 The abundance estimates from the MERP data were used to provide impact estimates for relevant projects as it is considered to represent the best available data, with its limitations noted. Although the methodology used within this note followed the approach proposed by the SNCBs via the EWGs, there are some key caveats that need to be understood. The main caveat of the data is that the MERP data used provide relative and not absolute density estimates. Combining absolute abundances (site-specific data) with relative abundances (MERP data) has been undertaken to provide indicative potential impacts but is not a true reflection of the absolute impacts. An additional important point is that the density estimates per 10 x 10 km^2 within the MERP data are an average density over multiple years. This will inherently reduce the abundance when compared to peak abundances that are generally used for analyses such as displacement analysis which requires a mean-peak estimate.

4.1.1.3 Despite these limitations, the methods set out in this report are considered to be based on the best available density data to provide quantified indicative impact estimates as requested by the EWG and therefore contextualise the results of the assessments undertaken for the Morgan Generation Assets application.

4.2 Project timeframes

4.2.1.1 The following projects have been included in the effect estimation approach conducted in this report:

- Burbo Bank Offshore Wind Farm
- Burbo Bank Extension Offshore Wind Farm
- Gwynt y Môr Offshore Wind Farm
- Ormonde Wind Farm
- Rampion Offshore Wind Farm
- Rampion 2 (Rampion Extension) Offshore Wind Farm
- Robin Rigg Offshore Wind Farm
- TwinHub (Wave Hub Floating Wind Farm)
- Walney 1 & 2 Offshore Wind Farms
- Walney (3 & 4) Extension Offshore Wind Farm
- West of Duddon Sands Offshore Wind Farm
- West of Orkney Offshore Wind Farm

4.2.1.2 The Morgan Generation Assets is expected to be operational in 2030. Table 4.1 identifies the year in which the relevant licence for each project will expire.

4.2.1.3 With the exception of Burbo Bank Extension and Rampion 2 (recently consented) and West of Orkney (awaiting consent decision) the lifetime of all the remaining projects will only overlap with Morgan Generation Assets for less than 10 years. This has significant implications for predicted in-combination impacts which will only persist for a proportion of the lifetime of the Morgan Generation Assets.

Table 4.1: Year of licence expiration for projects considered in this note.

Project	Species of interest	Year of licence expiration	Number of years overlapping with Morgan Generation Assets
Burbo Bank Offshore Wind Farm	Kittiwake Great black-backed gull Herring gull Guillemot Razorbill Manx shearwater Gannet	2039	9
Burbo Bank Extension Offshore Wind Farm	Great black-backed gull Razorbill Manx shearwater	2045	15
Gwynt y Môr Offshore Wind Farm	Kittiwake Great black-backed gull Herring gull Guillemot Razorbill Manx shearwater Gannet	2033	3
Ormonde Wind Farm	Kittiwake Guillemot Razorbill Manx shearwater Gannet	2036	6
Rampion Offshore Wind Farm	Manx shearwater	2039	9
Rampion 2 (Rampion Extension) Offshore Wind Farm	Manx shearwater	Unknown – similar timeframe to Morgan Generation Assets	-
Robin Rigg Offshore Wind Farm	Kittiwake Great black-backed gull Herring gull Lesser black-backed gull Guillemot Razorbill	2035	5

Project	Species of interest	Year of licence expiration	Number of years overlapping with Morgan Generation Assets
	Manx shearwater Gannet		
TwinHub (Wave Hub Floating Wind Farm)	Kittiwake Razorbill Manx shearwater Gannet	2037	7
Walney 1 & 2 Offshore Wind Farm	Kittiwake Great black-backed gull Herring gull Guillemot Razorbill Manx shearwater Gannet	2032	2
Walney (3 & 4) Extension Offshore Wind Farm	Razorbill Manx shearwater	2039	9
West of Duddon Sands Offshore Wind Farm	Kittiwake Great black-backed gull Herring gull Guillemot Razorbill Manx shearwater Gannet	2033	3
West of Orkney	Kittiwake	Unknown – similar timeframe to Morgan Generation Assets	-

4.3 Conclusion

4.3.1 Overview

4.3.1.1 The Applicant has considered the three gap-filling approaches recommended in the SNCB Advice Note (received October 2023) and, where relevant site-specific data for a historical project was not available, has undertaken a 'more rigorous assessment' using MERP data to provide abundance data. The Applicant has not progressed with the use of proxy data due to very high levels of variation recorded during site-specific surveys from wind farms within close proximity of historical projects and there being no pragmatic or consistent way to use proxy wind farms in a manner that is robust and justifiable. As discussed in the meeting on 29 August 2024, it is the Applicant's understanding that the SNCBs no longer recommend the use of a proxy approach.

4.3.1.2 The abundance estimates from the MERP data used to calculate collision risk modelling and displacement analyses for the additional projects were used as the best available data, with limitations noted in Section 1.1 and below. Although the

methodology used within this note follows the approach proposed by the SNCBs Advice Note and provides indicative estimates for currently unquantified impacts from historical projects, some key caveats should be highlighted.

4.3.1.3 The main caveat is that the MERP data used for the estimation of impact estimates for historical projects provide relative and not absolute density estimates. Combining the absolute abundances from site-specific data with relative abundances (MERP data) has been undertaken to provide an appraisal of the potential cumulative and in-combination impacts but not a true reflection of the absolute impacts.

4.3.1.4 An additional important point is that the density estimates per 10 km x 10 km square within the MERP data are average densities over 30+ years. The mathematical calculation to generate average densities over multiple years compared to using the mean peak from two years will inherently reduce the abundance. However, given the length of time this dataset covers, it is considered representative of the average relative abundance of birds using an area and sufficient to generate the indicative impact estimates as requested in the SNCBs Advice Note.

4.3.2 Assessment conclusions

4.3.2.1 The additional impact presented for displacement during operation and maintenance when considering the historical projects which had a qualitative assessment at application does not change the predicted magnitude of impact for any of the species considered in this note.

4.3.2.2 Similarly, the impact presented following site-specific CRM for both consented and as-built parameters for the historical projects which had a qualitative assessment at application does not change the predicted magnitude of impact for any of the species considered in this note.

4.3.2.3 The inclusion of quantitative estimates for historical projects is, therefore, not considered to alter the conclusions presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) and HRA Stage 2 ISAA Part Three: Special Protection Areas and Ramsar sites Assessments (APP-098). As such, the Applicant maintains that there are no significant cumulative effects and no AEOI in-combination with other plans and projects beyond reasonable scientific doubt and that the assessments presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the HRA Stage 2 ISAA Part Three: Special Protection Areas and Ramsar sites Assessments (APP-098) remain valid.

4.3.2.4 The Applicant considers that this technical note provides a level of detail and analysis that exceeds the requirements for a robust application but provides the information requested by SNCBs (i.e. indicative estimates for currently unquantified impacts from historical projects). It is intended to further facilitate the SNCB's understanding of the total quantitative cumulative and in-combination impact for offshore ornithology and view with respect to the conclusions presented in Volume 2, Chapter 5: Offshore ornithology (APP-023) and the Habitats Regulations Assessment (HRA) Stage 2 Information to Support Appropriate Assessment (ISAA) Part Three: Special Protection Areas and Ramsar sites Assessments (APP-098).

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Appendix A: Updated CEA with all projects quantified

A.1 Displacement

A.1.1 Kittiwake

A.1.1.1 EIA basis

Table A.1: Kittiwake cumulative abundances for offshore wind projects for disturbance and displacement assessment during operations (all values represent no. of birds).

Project	Pre-breeding season cumulative abundance	Breeding season cumulative abundance	Post-breeding season cumulative abundance
Tier 1			
Awel y Môr Offshore Wind Farm	421	477	181
Burbo Bank Offshore Wind Farm	22	9	20
Burbo Bank Extension Offshore Wind Farm	140	1,318	276
Erebus Floating Wind Demo	508	2	2,022
Gwynt y Môr Offshore Wind Farm	72	33	65
Mona Offshore Wind Farm	884	355	560
Ormonde Wind Farm	22	60	20
Rampion Offshore Wind Farm	375	401	429
Rampion 2 (Rampion Extension) Offshore Wind Farm	286	5	97
Robin Rigg Offshore Wind Farm	30	162	28
TwinHub (Wave Hub Floating Wind Farm)	18	9	106
Walney 1 & 2 Offshore Wind Farm	94	39	86
Walney (3 & 4) Extension Offshore Wind Farm	336	161	645
West of Duddon Sands Offshore Wind Farm	68	454	62
West of Orkney Windfarm	1,217	690	660
White Cross Offshore Windfarm	432	38	83
Tier 2			

Project	Pre-breeding season cumulative abundance	Breeding season cumulative abundance	Post-breeding season cumulative abundance
Morecambe Offshore Wind Farm: Generation Assets	568	2,625	2,574
Morgan Offshore Wind Farm: Generation Assets	791	505	1,151
Scenario Totals			
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects	**6,282**	**7,344**	**9,062**

A.1.1.2 HRA basis

Table A.2: In-combination abundance for kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	0.010	0.001	0.001	4.8	0.1	0.3
Burbo Bank Offshore Wind Farm	0.019	0.001	0.001	0.2	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	0.019	0.001	0.001	24.4	0.2	0.1
Erebus Floating Wind Demo	0.016	0.001	0.001	0.0	1.3	0.4
Gwynt y Môr Offshore Wind Farm	0.019	0.001	0.001	0.6	0.0	0.1
Mona Offshore Wind Farm	0.016	0.001	0.001	5.7	0.3	0.7
Morecambe Offshore Wind Farm: Generation Assets	0.019	0.001	0.001	48.6	1.6	0.5
Morgan Offshore Wind Farm: Generation Assets	0.019	0.001	0.001	9.4	0.7	0.6
Ormonde Wind Farm	0.019	0.001	0.001	1.1	0.0	0.0
Rampion Offshore Wind Farm	No connectivity	0.001	0.001	-	0.3	0.3
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.001	0.001	-	0.1	0.2
Robin Rigg Offshore Wind Farm	0.019	0.001	0.001	3.0	0.0	0.0

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.001	0.001	-	0.1	0.0
Walney 1 & 2 Offshore Wind Farm	0.019	0.001	0.001	0.7	0.1	0.1
Walney (3 & 4) Extension Offshore Wind Farm	0.019	0.001	0.001	3.0	0.4	0.3
West of Duddon Sands Offshore Wind Farm	0.019	0.001	0.001	8.4	0.0	0.1
West of Orkney Windfarm	No connectivity	0.001	0.001	-	0.4	1.0
White Cross Offshore Windfarm	0.019	0.001	0.001	0.7	0.1	0.4
Annual total				**121.3**		

Table A.3: In-combination abundance for kittiwake at the Cape Wrath SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	No connectivity	0.014	0.024	-	2.5	10.1
Burbo Bank Offshore Wind Farm	No connectivity	0.014	0.024	-	0.3	0.5
Burbo Bank Extension Offshore Wind Farm	No connectivity	0.014	0.024	-	3.8	3.3
Erebus Floating Wind Demo	No connectivity	0.014	0.024	-	27.5	12.2

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Gwynt y Môr Offshore Wind Farm	No connectivity	0.014	0.024	-	0.9	1.7
Mona Offshore Wind Farm	No connectivity	0.014	0.024	-	7.6	21.2
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.014	0.024	-	35.0	13.6
Morgan Offshore Wind Farm: Generation Assets	No connectivity	0.014	0.024	-	15.7	18.9
Ormonde Wind Farm	No connectivity	0.014	0.024	-	0.3	0.5
Rampion Offshore Wind Farm	No connectivity	0.014	0.024	-	5.8	9.0
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.014	0.024	-	1.3	6.8
Robin Rigg Offshore Wind Farm	No connectivity	0.014	0.024	-	0.4	0.2
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.014	0.024	-	1.4	0.4
Walney 1 & 2 Offshore Wind Farm	No connectivity	0.014	0.024	-	1.2	2.3
Walney (3 & 4) Extension Offshore Wind Farm	No connectivity	0.014	0.024	-	8.8	8.0
West of Duddon Sands Offshore Wind Farm	No connectivity	0.014	0.024	-	0.8	1.6

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
West of Orkney Windfarm	0.229	0.014	0.024	157.7	9.0	29.1
White Cross Offshore Windfarm	No connectivity	0.014	0.024	-	1.1	10.3
Annual total				**431.5**		

A.1.2 Guillemot

A.1.2.1 EIA basis

Table A.4: Guillemot cumulative abundances for offshore wind projects for disturbance and displacement assessment during operations (all values represent no. of birds).

Project	Breeding season cumulative abundance	Non-breeding season cumulative abundance
Tier 1		
Awel y Môr Offshore Wind Farm	1,569	2,919
Burbo Bank Offshore Wind Farm	41	42
Burbo Bank Extension Offshore Wind Farm	1,000	1,561
Erebus Floating Wind Demo	7,001	28,338
Gwynt y Môr Offshore Wind Farm	149	146
Mona Offshore Wind Farm	4,220	3,756
Ormonde Wind Farm	912	43
Robin Rigg Offshore Wind Farm	138	73
TwinHub (Wave Hub Floating Wind Farm)	39	217
Walney 1 & 2 Offshore Wind Farm	161	173
Walney (3 & 4) Extension Offshore Wind Farm	4,169	1,927
West of Duddon Sands Offshore Wind Farm	1,321	126
West of Orkney Windfarm	7,973	4,393
White Cross Offshore Windfarm	3,304	1,059
Tier 2		
Morecambe Offshore Wind Farm: Generation Assets	4,050	7,647
Morgan Offshore Wind Farm: Generation Assets	4,010	3,824
Scenario Totals		
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects	**40,055**	**56,245**

A.1.2.2 HRA basis

Table A.5: In-combination abundance for guillemot at the Flannan Isles SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values (no. of birds)	
	Breeding	Non-breeding	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	0.016	-	47.7
Burbo Bank Offshore Wind Farm	No connectivity	0.016	-	0.7
Burbo Bank Extension Offshore Wind Farm	No connectivity	0.016	-	25.5
Erebus Floating Wind Demo	No connectivity	0.016	-	463.5
Gwynt y Môr Offshore Wind Farm	No connectivity	0.016	-	2.4
Mona Offshore Wind Farm	No connectivity	0.016	-	61.4
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.016	-	125.1
Morgan Offshore Wind Farm: Generation Assets	No connectivity	0.016	-	62.5
Ormonde Wind Farm	No connectivity	0.016	-	0.7
Robin Rigg Offshore Wind Farm	No connectivity	0.016	-	1.2
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.016	-	3.6
Walney 1 & 2 Offshore Wind Farm	No connectivity	0.016	-	2.8
Walney (3 & 4) Extension Offshore Wind Farm	No connectivity	0.016	-	31.5
West of Duddon Sands Offshore Wind Farm	No connectivity	0.016	-	2.1
West of Orkney Windfarm	No connectivity	0.016	-	71.9
White Cross Offshore Windfarm	No connectivity	0.016	-	17.3
Annual totals				
Scenario 2			**187.6**	

Project	Seasonal apportioning values		Seasonal abundance values (no. of birds)	
	Breeding	Non-breeding	Breeding	Non-breeding
Scenario 3			919.9	

A.1.3 Razorbill

Table A.6: Razorbill cumulative abundances for offshore wind projects for disturbance and displacement assessment during operations (all values represent no. of birds).

Project	Pre-breeding cumulative abundance	Breeding season cumulative abundance	Post-breeding cumulative abundance	Non-breeding cumulative abundance
Tier 1				
Awel y Môr Offshore Wind Farm	336	140	66	150
Burbo Bank Offshore Wind Farm	10	3	6	8
Burbo Bank Extension Offshore Wind Farm	23	64	13	29
Erebus Floating Wind Demo	896	194	1,708	1,069
Gwynt y Môr Offshore Wind Farm	39	12	22	32
Mona Offshore Wind Farm	1,924	83	91	421
Ormonde Wind Farm	10	174	6	8
Robin Rigg Offshore Wind Farm	15	63	11	14
TwinHub (Wave Hub Floating Wind Farm)	11	12	3	53
Walney 1 & 2 Offshore Wind Farm	40	12	25	34
Walney (3 & 4) Extension Offshore Wind Farm	82	76	874	3,066
West of Duddon Sands Offshore Wind Farm	28	8	18	202
West of Orkney Windfarm	74	141	112	19
White Cross Offshore Windfarm	345	40	40	361
Tier 2				
Morecambe Offshore Wind Farm: Generation Assets	389	222	674	596

Project	Pre-breeding cumulative abundance	Breeding season cumulative abundance	Post-breeding cumulative abundance	Non-breeding cumulative abundance
Morgan Offshore Wind Farm: Generation Assets	328	35	254	1,170
Scenario Totals				
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects	**4,550**	**1,281**	**3,923**	**7,233**

A.1.4 Manx shearwater

Table A.7: Manx shearwater cumulative abundances for offshore wind projects for disturbance and displacement assessment during operations (all values represent no. of birds).

Project	Pre-breeding season cumulative abundance	Breeding season cumulative abundance	Post-breeding season cumulative abundance
Tier 1			
Awel y Môr Offshore Wind Farm	177	26	214
Burbo Bank Offshore Wind Farm	0	2	1
Burbo Bank Extension Offshore Wind Farm	0	443	1
Erebus Floating Wind Demo	18	1,540	557
Gwynt y Môr Offshore Wind Farm	1	13	3
Mona Offshore Wind Farm	3	1,249	182
Ormonde Wind Farm	0	1,001	1
Rampion Offshore Wind Farm	0	15	0
Rampion 2 (Rampion Extension) Offshore Wind Farm	0	8	0
Robin Rigg Offshore Wind Farm	0	138	1
TwinHub (Wave Hub Floating Wind Farm)	1	1,270	3
Walney 1 & 2 Offshore Wind Farm	1	14	4
Walney (3 & 4) Extension Offshore Wind Farm	2	588	324
West of Duddon Sands Offshore Wind Farm	1	544	3
West of Orkney Windfarm	0	12	3
White Cross Offshore Windfarm	33	12,126	22
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets	0	7,577	6
Morgan Offshore Wind Farm: Generation Assets	0	1,254	911
Scenario Totals			

Project	Pre-breeding season cumulative abundance	Breeding season cumulative abundance	Post-breeding season cumulative abundance
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects	**237**	**27,820**	**2,237**

A.1.5 Gannet

Table A.8: Gannet cumulative abundances for offshore wind projects for disturbance and displacement assessment during operations (all values represent no. of birds).

Project	Pre-breeding season cumulative abundance	Breeding season cumulative abundance	Post-breeding season cumulative abundance
Tier 1			
Awel y Môr Offshore Wind Farm	0	328	201
Burbo Bank Offshore Wind Farm	3	6	5
Burbo Bank Extension Offshore Wind Farm	22	648	25
Erebus Floating Wind Demo	100	224	334
Gwynt y Môr Offshore Wind Farm	13	27	20
Mona Offshore Wind Farm	28	251	58
Ormonde Wind Farm	3	199	6
Robin Rigg Offshore Wind Farm	4	14	7
TwinHub (Wave Hub Floating Wind Farm)	10	244	153
Walney 1 & 2 Offshore Wind Farm	15	36	26
Walney (3 & 4) Extension Offshore Wind Farm	24	150	259
West of Duddon Sands Offshore Wind Farm	11	431	18
West of Orkney Windfarm	140	852	1,368
White Cross Offshore Windfarm	57	239	141
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets	0	748	164
Morgan Offshore Wind Farm: Generation Assets	35	154	65
Scenario Totals			
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects	**464**	**4,552**	**2,851**

A.2 Collision

A.2.1 Kittiwake

A.2.1.1 EIA basis

Table A.9: Expected seasonal and annual collision mortality across relevant wind farms for the kittiwake using consented turbine parameters, where available (All values represent the no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Post-breeding	Pre-breeding	Total
Tier 1				
Awel y Môr Offshore Wind Farm	4.5	2.3	3.5	10.3
Burbo Bank Offshore Wind Farm	0.1	0.2	0.2	0.5
Burbo Bank Extension Offshore Wind Farm	5.9	0.5	0.3	6.7
Erebus Floating Wind Demo	0.4	7.0	3.6	11.0
Gwynt y Môr Offshore Wind Farm	2.6	3.1	2.8	8.6
Mona Offshore Wind Farm	2.8	2.5	4.5	9.8
Ormonde Wind Farm	0.3	0.3	0.1	0.6
Rampion Offshore Wind Farm	12.8	5.0	5.4	23.2
Rampion 2 (Rampion Extension) Offshore Wind Farm	0.4	2.9	5.2	8.5
Robin Rigg Offshore Wind Farm	0.3	0.4	0.3	1.0
TwinHub (Wave Hub Floating Wind Farm)	0.4	0.9	1.5	2.8
Walney 1 & 2 Offshore Wind Farm	1.2	0.8	0.8	2.7
Walney (3 & 4) Extension Offshore Wind Farm	6.0	16.9	12.9	35.8
West of Duddon Sands Offshore Wind Farm	0.9	1.2	1.0	3.1
West of Orkney Windfarm	8.1	5.3	0.8	14.2
White Cross Offshore Windfarm	0.1	0.5	3.7	4.3
Tier 2				
Morecambe Offshore Wind Farm: Generation Assets	4.4	3.4	1.6	9.3
Morgan Offshore Wind Farm: Generation Assets	1.9 (8.1)	4.3 (18.4)	3.2 (13.6)	9.4 (40.0)
Scenario Totals				
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects				**163.6 (568.8)**

Table A.10: Expected seasonal and annual collision mortality across relevant wind farms for the kittiwake using as-built turbine parameters (All values represent the no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are values calculated using SNCB parameters).

Project	Breeding	Post-breeding	Pre-breeding	Total
Tier 1				
Awel y Môr Offshore Wind Farm	4.5	2.3	3.5	10.3
Burbo Bank Offshore Wind Farm	0.2	0.2	0.2	0.6
Burbo Bank Extension Offshore Wind Farm	5.9	0.5	0.3	6.7
Erebus Floating Wind Demo	0.4	7.0	3.6	11.0
Gwynt y Môr Offshore Wind Farm	0.3	0.4	0.4	1.1
Mona Offshore Wind Farm	2.8	2.5	4.5	9.8
Ormonde Wind Farm	0.3	0.3	0.1	0.6
Rampion Offshore Wind Farm	12.8	5.0	5.4	23.2
Rampion 2 (Rampion Extension) Offshore Wind Farm	0.4	2.9	5.2	8.5
Robin Rigg Offshore Wind Farm	0.3	0.4	0.3	1.0
TwinHub (Wave Hub Floating Wind Farm)	0.4	0.9	1.5	2.8
Walney 1 & 2 Offshore Wind Farm	1.2	0.8	0.8	2.7
Walney (3 & 4) Extension Offshore Wind Farm	6.0	16.9	12.9	35.8
West of Duddon Sands Offshore Wind Farm	0.9	1.2	1.0	3.1
West of Orkney Windfarm	8.1	5.3	0.8	14.2
White Cross Offshore Windfarm	0.1	0.5	3.7	4.3
Tier 2				
Morecambe Offshore Wind Farm: Generation Assets	4.4	3.4	1.6	9.3
Morgan Offshore Wind Farm: Generation Assets	1.9 (8.1)	4.3 (18.4)	3.2 (13.6)	9.4 (40.0)
Scenario Totals				
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects				**155.7 (541.6)**

A.2.1.2 HRA basis

Table A.11: Predicted annual mortality of kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA resulting from collision risk impacts from projects considered in-combination using consented turbine parameters, where available (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	0.010	0.001	0.001	0.2	0.0	0.0	0.0	0.0	0.0
Burbo Bank Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	0.019	0.001	0.001	0.4	0.0	0.0	0.1	0.0	0.0
Erebus Floating Wind Demo	0.016	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Gwynt y Môr Offshore Wind Farm	0.019	0.001	0.001	0.2	0.0	0.0	0.0	0.0	0.0
Mona Offshore Wind Farm	0.016	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.019	0.001	0.001	0.3	0.0	0.0	0.1	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	0.019	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Ormonde Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Rampion Offshore Wind Farm	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Robin Rigg Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Walney 1 & 2 Offshore Wind Farm	0.019	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0
Walney (3 & 4) Extension Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.1	0.0	0.0
West of Duddon Sands Offshore Wind Farm	0.019	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0
West of Orkney Windfarm	No connectivity	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
White Cross Offshore Windfarm	0.016	0.001	0.001	0.4	0.0	0.0	0.0	0.0	0.0

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Annual totals									
Scenario 3				**2.0**			**0.6**		

Table A.12: Predicted annual mortality of kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA resulting from collision risk impacts from projects considered in-combination using as-built turbine parameters (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	0.010	0.001	0.001	0.2	0.0	0.0	0.0	0.0	0.0
Burbo Bank Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	0.019	0.001	0.001	0.4	0.0	0.0	0.1	0.0	0.0
Erebus Floating Wind Demo	0.016	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Gwynt y Môr Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Mona Offshore Wind Farm	0.016	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.019	0.001	0.001	0.3	0.0	0.0	0.1	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	0.019	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Ormonde Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Rampion Offshore Wind Farm	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Robin Rigg Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Walney 1 & 2 Offshore Wind Farm	0.019	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0
Walney (3 & 4) Extension Offshore Wind Farm	0.019	0.001	0.001	0.0	0.0	0.0	0.1	0.0	0.0
West of Duddon Sands Offshore Wind Farm	0.019	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0
West of Orkney Windfarm	No connectivity	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0

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Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
White Cross Offshore Windfarm	0.016	0.001	0.001	0.4	0.0	0.0	0.0	0.0	0.0
Annual totals									
Scenario 3				**1.9**			**0.6**		

Table A.13 Predicted annual mortality of kittiwake at the Cape Wrath SPA resulting from collision risk impacts from projects considered in-combination using consented turbine parameters, where available (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.3	-	0.0	0.1
Burbo Bank Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
Erebus Floating Wind Demo	No connectivity	0.014	0.024	-	0.3	0.3	-	0.1	0.1
Gwynt y Môr Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.2	-	0.0	0.1
Mona Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.1
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.014	0.024	-	0.2	0.1	-	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	No connectivity	0.014	0.024	-	0.3	0.3	-	0.1	0.1

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Ormonde Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
Rampion Offshore Wind Farm	No connectivity	0.014	0.024	-	0.2	0.4	-	0.1	0.1
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.4	-	0.0	0.1
Robin Rigg Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.0
Walney 1 & 2 Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.0
Walney (3 & 4) Extension Offshore Wind Farm	No connectivity	0.014	0.024	-	0.8	1.1	-	0.2	0.3
West of Duddon Sands Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.1	-	0.0	0.0
West of Orkney Windfarm	0.229	0.014	0.024	4.5	0.2	0.5	1.3	0.1	0.1

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
White Cross Offshore Windfarm	No connectivity	0.014	0.024	-	0.0	0.3	-	0.0	0.1
Annual totals									
Scenario 3				**11.5**			**3.4**		

Table A.14: Predicted annual mortality of kittiwake at the Cape Wrath SPA resulting from collision risk impacts from projects considered in-combination using as-built turbine parameters (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.3	-	0.0	0.1
Burbo Bank Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
Erebus Floating Wind Demo	No connectivity	0.014	0.024	-	0.3	0.3	-	0.1	0.1
Gwynt y Môr Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.0
Mona Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.1
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.014	0.024	-	0.2	0.1	-	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	No connectivity	0.014	0.024	-	0.3	0.3	-	0.1	0.1

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Ormonde Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
Rampion Offshore Wind Farm	No connectivity	0.014	0.024	-	0.2	0.4	-	0.1	0.1
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.4	-	0.0	0.1
Robin Rigg Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.0	-	0.0	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.0
Walney 1 & 2 Offshore Wind Farm	No connectivity	0.014	0.024	-	0.0	0.1	-	0.0	0.0
Walney (3 & 4) Extension Offshore Wind Farm	No connectivity	0.014	0.024	-	0.8	1.1	-	0.2	0.3
West of Duddon Sands Offshore Wind Farm	No connectivity	0.014	0.024	-	0.1	0.1	-	0.0	0.0
West of Orkney Windfarm	0.229	0.014	0.024	4.5	0.2	0.5	1.3	0.1	0.1

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Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate) (no. of collisions)			Seasonal apportioned collision values (99.79% avoidance rate) (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
White Cross Offshore Windfarm	No connectivity	0.014	0.024	-	0.0	0.3	-	0.0	0.1
Annual totals									
Scenario 3				**11.2**			**3.3**		

A.2.2 Great black-backed gull

A.2.2.1 EIA basis

Table A.15: Expected seasonal and annual collision mortality across relevant wind farms for the great black-backed gull using consented turbine parameters, where available (all values represent no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Non-breeding	Total
Tier 1			
Awel y Môr Offshore Wind Farm	0.8	0.1	0.9
Burbo Bank Offshore Wind Farm	0.2	0.1	0.3
Burbo Bank Extension Offshore Wind Farm	0.6	0.4	1.0
Erebus Floating Wind Demo	0.0	0.1	0.1
Gwynt y Môr Offshore Wind Farm	0.9	0.7	1.5
Mona Offshore Wind Farm	0.3	0.5	0.7
Ormonde Wind Farm	0.0	0.0	0.0
Rampion Offshore Wind Farm	0.7	3.9	4.7
Rampion 2 (Rampion Extension) Offshore Wind Farm	0.9	2.0	3.0
Robin Rigg Offshore Wind Farm	0.3	0.3	0.6
TwinHub (Wave Hub Floating Wind Farm)	1.0	1.4	2.3
Walney 1 & 2 Offshore Wind Farm	0.7	0.6	1.3
Walney (3 & 4) Extension Offshore Wind Farm	0.7	4.4	5.1
West of Duddon Sands Offshore Wind Farm	0.8	0.4	1.2
White Cross Offshore Windfarm	0.1	0.0	0.1
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets	0.1	0.1	0.1
Morgan Offshore Wind Farm: Generation Assets	0.1 (1.1)	0.6 (4.6)	0.7 (5.7)
Scenario Totals			
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects			**23.8 (161.5)**

Table A.16: Expected seasonal and annual collision mortality across relevant wind farms for the great black-backed gull using as-built turbine parameters (all values represent no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Non-breeding	Total
Tier 1			
Awel y Môr Offshore Wind Farm	0.8	0.1	0.9
Burbo Bank Offshore Wind Farm	0.2	0.2	0.4
Burbo Bank Extension Offshore Wind Farm	0.3	0.2	0.6
Erebus Floating Wind Demo	0.0	0.1	0.1
Gwynt y Môr Offshore Wind Farm	0.2	0.2	0.4
Mona Offshore Wind Farm	0.3	0.5	0.7
Ormonde Wind Farm	0.0	0.0	0.0
Rampion Offshore Wind Farm	0.7	3.9	4.7
Rampion 2 (Rampion Extension) Offshore Wind Farm	0.9	2.0	3.0
Robin Rigg Offshore Wind Farm	0.3	0.3	0.6
TwinHub (Wave Hub Floating Wind Farm)	1.0	1.4	2.3
Walney 1 & 2 Offshore Wind Farm	0.7	0.6	1.3
Walney (3 & 4) Extension Offshore Wind Farm	0.7	4.4	5.1
West of Duddon Sands Offshore Wind Farm	0.8	0.4	1.2
White Cross Offshore Windfarm	0.1	0.0	0.1
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets	0.1	0.1	0.1
Morgan Offshore Wind Farm: Generation Assets	0.1 (1.1)	0.6 (4.6)	0.7 (5.7)
Scenario Totals			
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects			**22.3 (150.9)**

A.2.2.2 HRA basis

Table A.17: Predicted annual mortality of great black-backed gull at the Isles of Scilly SPA resulting from collision risk impacts from projects considered in-combination using consented turbine parameters, where available (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values		Seasonal apportioned collision impacts (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision impacts (99.91% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	0.091	-	0.1	-	0.0
Burbo Bank Offshore Wind Farm	No connectivity	0.091	-	0.1	-	0.0
Burbo Bank Extension Offshore Wind Farm	No connectivity	0.091	-	0.3	-	0.0
Erebus Floating Wind Demo	No connectivity	0.091	-	0.1	-	0.0
Gwynt y Môr Offshore Wind Farm	No connectivity	0.091	-	0.4	-	0.1
Mona Offshore Wind Farm	No connectivity	0.091	-	0.3	-	0.0
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.091	-	0.0	-	0.0
Morgan Offshore Wind Farm: Generation Assets	No connectivity	0.091	-	0.4	-	0.1

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Project	Seasonal apportioning values		Seasonal apportioned collision impacts (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision impacts (99.91% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Ormonde Wind Farm	No connectivity	0.091	-	0.0	-	0.0
Rampion Offshore Wind Farm	No connectivity	0.091	-	2.4	-	0.4
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.091	-	1.3	-	0.2
Robin Rigg Offshore Wind Farm	No connectivity	0.091	-	0.2	-	0.0
TwinHub (Wave Hub Floating Wind Farm)	0.414	0.091	2.7	0.8	0.1	0.1
Walney 1 & 2 Offshore Wind Farm	No connectivity	0.091	-	0.3	-	0.1
Walney (3 & 4) Extension Offshore Wind Farm	No connectivity	0.091	-	2.7	-	0.4
West of Duddon Sands Offshore Wind Farm	No connectivity	0.091	-	0.2	-	0.0
White Cross Offshore Windfarm	No connectivity	0.091	-	0.0	-	0.0
Totals						
Scenario 3			**10.4**		**1.5**	

Table A.18: Predicted annual mortality of great black-backed gull at the Isles of Scilly SPA resulting from collision risk impacts from projects considered in-combination using as-built turbine parameters (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values		Seasonal apportioned collision impacts (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision impacts (99.91% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	0.091	-	0.1	-	0.0
Burbo Bank Offshore Wind Farm	No connectivity	0.091	-	0.1	-	0.0
Burbo Bank Extension Offshore Wind Farm	No connectivity	0.091	-	0.1	-	0.0
Erebus Floating Wind Demo	No connectivity	0.091	-	0.1	-	0.0
Gwynt y Môr Offshore Wind Farm	No connectivity	0.091	-	0.1	-	0.0
Mona Offshore Wind Farm	No connectivity	0.091	-	0.3	-	0.0
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.091	-	0.0	-	0.0
Morgan Offshore Wind Farm: Generation Assets	No connectivity	0.091	-	0.4	-	0.1
Ormonde Wind Farm	No connectivity	0.091	-	0.0	-	0.0

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Project	Seasonal apportioning values		Seasonal apportioned collision impacts (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision impacts (99.91% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Rampion Offshore Wind Farm	No connectivity	0.091	-	2.4	-	0.4
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.091	-	1.3	-	0.2
Robin Rigg Offshore Wind Farm	No connectivity	0.091	-	0.2	-	0.0
TwinHub (Wave Hub Floating Wind Farm)	0.414	0.091	2.7	0.8	0.1	0.1
Walney 1 & 2 Offshore Wind Farm	No connectivity	0.091	-	0.3	-	0.1
Walney (3 & 4) Extension Offshore Wind Farm	No connectivity	0.091	-	2.7	-	0.4
West of Duddon Sands Offshore Wind Farm	No connectivity	0.091	-	0.2	-	0.0
White Cross Offshore Windfarm	No connectivity	0.091	-	0.0	-	0.0
Totals						
Scenario 3			**10.0**		**1.5**	

A.2.3 Herring gull

A.2.3.1 EIA basis

Table A.19: Expected seasonal and annual collision mortality across relevant wind farms for the herring gull using consented turbine parameters, where available (all values represent number of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Non-breeding	Total
Tier 1			
Awel y Môr Offshore Wind Farm	0.8	0.6	1.4
Burbo Bank Offshore Wind Farm	1.5	1.2	2.7
Burbo Bank Extension Offshore Wind Farm	12.9	9.9	22.8
Erebus Floating Wind Demo	2.2	1.4	3.6
Gwynt y Môr Offshore Wind Farm	17.3	14.3	31.6
Mona Offshore Wind Farm	0.0	1.2	1.2
Ormonde Wind Farm	0.0	0.3	0.3
Robin Rigg Offshore Wind Farm	5.6	2.6	8.2
TwinHub (Wave Hub Floating Wind Farm)	15.2	11.2	26.4
Walney 1 & 2 Offshore Wind Farm	15.9	9.0	24.9
Walney (3 & 4) Extension Offshore Wind Farm	32.5	19.9	52.3
West of Duddon Sands Offshore Wind Farm	26.3	5.9	32.2
West of Orkney Windfarm	Not modelled see section 2.1.1		
White Cross Offshore Windfarm	0.0	0.2	0.2
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets.	1.6	1.1	2.7
Morgan Offshore Wind Farm: Generation Assets	1.4 (2.1)	5.4 (8.0)	6.8 (10.1)
Scenario Totals			
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects			**217.5 (277.8)**

Table A.20: Expected seasonal and annual collision mortality across relevant wind farms for the herring gull using as-built turbine parameters (all values represent number of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Non-breeding	Total
Tier 1			
Awel y Môr Offshore Wind Farm	0.8	0.6	1.4
Burbo Bank Offshore Wind Farm	1.6	1.3	3.0
Burbo Bank Extension Offshore Wind Farm	12.9	9.9	22.8
Erebus Floating Wind Demo	2.2	1.4	3.6
Gwynt y Môr Offshore Wind Farm	4.2	3.5	7.7
Mona Offshore Wind Farm	0.0	1.2	1.2
Ormonde Wind Farm	0.0	0.3	0.3
Robin Rigg Offshore Wind Farm	5.6	2.6	8.2
TwinHub (Wave Hub Floating Wind Farm)	15.2	11.2	26.4
Walney 1 & 2 Offshore Wind Farm	15.9	9.0	24.9
Walney (3 & 4) Extension Offshore Wind Farm	32.5	19.9	52.3
West of Duddon Sands Offshore Wind Farm	26.3	5.9	32.2
West of Orkney Windfarm	Not modelled see section 2.1.1		
White Cross Offshore Windfarm	0.0	0.2	0.2
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets.	1.6	1.1	2.7
Morgan Offshore Wind Farm: Generation Assets	1.4 (2.1)	5.4 (8.0)	6.8 (10.1)
Scenario Totals			
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects			**193.8 (247.7)**

A.2.3.2 HRA basis

Table A.21: Predicted annual mortality of herring gull at the Morecambe Bay and Duddon Estuary SPA resulting from collision risk impacts from projects considered in-combination using consented turbine parameters, where available (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values		Seasonal apportioned collision values (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision values (99.52% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	0.062	0.016	0.1	0.0	0.0	0.0
Burbo Bank Offshore Wind Farm	0.060	0.016	0.1	0.0	0.1	0.0
Burbo Bank Extension Offshore Wind Farm	0.060	0.016	1.0	0.2	0.8	0.2
Erebus Floating Wind Demo	No connectivity	0.016	-	0.0	-	0.0
Gwynt y Môr Offshore Wind Farm	0.060	0.016	1.3	0.3	1.0	0.2
Mona Offshore Wind Farm	0.110	0.016	0.0	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.000	0.016	0.0	0.0	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	0.159	0.016	0.3	0.1	0.2	0.1

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Project	Seasonal apportioning values		Seasonal apportioned collision values (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision values (99.52% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Ormonde Wind Farm	0.411	0.016	0.0	0.0	0.0	0.0
Robin Rigg Offshore Wind Farm	0.060	0.016	0.4	0.1	0.3	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.016	-	0.2	-	0.2
Walney 1 & 2 Offshore Wind Farm	0.411	0.016	8.3	0.2	6.5	0.1
Walney (3 & 4) Extension Offshore Wind Farm	0.411	0.016	17.0	0.4	13.3	0.3
West of Duddon Sands Offshore Wind Farm	0.411	0.016	13.7	0.1	10.8	0.1
White Cross Offshore Windfarm	No connectivity	0.016	-	0.0	-	0.0
Totals						
Scenario 3			**44.1**		**34.5**	

Table A.22: Predicted annual mortality of herring gull at the Morecambe Bay and Duddon Estuary SPA resulting from collision risk impacts from projects considered in-combination using as-built turbine parameters (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values		Seasonal apportioned collision values (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision values (99.52% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	0.062	0.016	0.1	0.0	0.0	0.0
Burbo Bank Offshore Wind Farm	0.060	0.016	0.1	0.0	0.1	0.0
Burbo Bank Extension Offshore Wind Farm	0.060	0.016	1.0	0.2	0.8	0.2
Erebus Floating Wind Demo	No connectivity	0.016	-	0.0	-	0.0
Gwynt y Môr Offshore Wind Farm	0.060	0.016	0.3	0.1	0.3	0.1
Mona Offshore Wind Farm	0.110	0.016	0.0	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.000	0.016	0.0	0.0	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	0.159	0.016	0.3	0.1	0.2	0.1
Ormonde Wind Farm	0.411	0.016	0.0	0.0	0.0	0.0

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Project	Seasonal apportioning values		Seasonal apportioned collision values (99.39% avoidance rate) (no. of collisions)		Seasonal apportioned collision values (99.52% avoidance rate) (no. of collisions)	
	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Robin Rigg Offshore Wind Farm	0.060	0.016	0.4	0.1	0.3	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.016	-	0.2	-	0.2
Walney 1 & 2 Offshore Wind Farm	0.411	0.016	8.3	0.2	6.5	0.1
Walney (3 & 4) Extension Offshore Wind Farm	0.411	0.016	17.0	0.4	13.3	0.3
West of Duddon Sands Offshore Wind Farm	0.411	0.016	13.7	0.1	10.8	0.1
White Cross Offshore Windfarm	No connectivity	0.016	-	0.0	-	0.0
Totals						
Scenario 3			**42.9**		**33.6**	

A.2.4 Lesser black-backed gull

A.2.4.1 Consented, where available

Table A.23: Expected seasonal and annual collision mortality across relevant wind farms for the lesser black-backed gull (all values represent no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Post-breeding	Non-breeding	Pre-breeding	Total
Tier 1					
Awel y Môr Offshore Wind Farm	Not modelled see section 2.1.1				
Burbo Bank Offshore Wind Farm	0.8	0.3	0.6	0.2	1.8
Burbo Bank Extension Offshore Wind Farm	33.7	5.9	0.4	0.5	40.5
Erebus Floating Wind Demo	6.2	0.0	0.0	0.0	6.2
Gwynt y Môr Offshore Wind Farm	1.9	0.8	1.5	0.4	4.6
Mona Offshore Wind Farm	0.3	0.0	0.6	0.6	1.5
Ormonde Wind Farm	14.2	5.0	0.8	0.1	20.2
Robin Rigg Offshore Wind Farm	3.4	0.3	0.3	0.2	4.2
TwinHub (Wave Hub Floating Wind Farm)	2.7	2.1	1.1	0.4	6.3
Walney 1 & 2 Offshore Wind Farm	26.9	8.8	13.5	3.4	52.6
Walney (3 & 4) Extension Offshore Wind Farm	6.1	4.2	9.8	5.9	26.0
West of Duddon Sands Offshore Wind Farm	24.7	8.0	12.4	3.1	48.2
West of Orkney Windfarm	Not modelled see section 2.1.1				
White Cross Offshore Windfarm	0.3	0.0	0.0	0.0	0.3
Tier 2					
Morecambe Offshore Wind Farm: Generation Assets.	1.5	1.6	0.3	0.0	3.3
Morgan Offshore Wind Farm: Generation Assets	0.2 (0.3)	0.2 (0.4)	0.2 (0.3)	0.2 (0.3)	0.8 (1.2)

Project	Breeding	Post-breeding	Non-breeding	Pre-breeding	Total
Scenario Totals					
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects					**216.5 (287.2)**

A.2.5 Gannet

A.2.5.1 Consented, where available

Table A.24: Expected seasonal and annual collision mortality across relevant wind farms for gannet (all values represent no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Post-breeding	Pre-breeding	Total
Tier 1				
Awel y Môr Offshore Wind Farm	10.9	2.5	0.0	13.4
Burbo Bank Offshore Wind Farm	0.3	0.1	0.0	0.4
Burbo Bank Extension Offshore Wind Farm	11.9	0.2	0.1	12.2
Erebus Floating Wind Demo	4.1	0.2	0.3	4.6
Gwynt y Môr Offshore Wind Farm	6.6	1.1	0.9	8.6
Mona Offshore Wind Farm	1.2	0.1	0.1	1.5
Ormonde Wind Farm	6.7	0.1	0.1	6.9
Robin Rigg Offshore Wind Farm	0.6	0.1	0.1	0.8
TwinHub (Wave Hub Floating Wind Farm)	15.0	4.4	6.8	26.1
Walney 1 & 2 Offshore Wind Farm	1.7	0.3	0.2	2.2
Walney (3 & 4) Extension Offshore Wind Farm	11.3	12.4	0.8	24.5
West of Duddon Sands Offshore Wind Farm	1.7	0.3	0.2	2.3
West of Orkney Windfarm	39.8	7.9	1.2	48.8
White Cross Offshore Windfarm	1.0	0.4	0.0	1.4
Tier 2				
Morecambe Offshore Wind Farm: Generation Assets	1.9	0.0	0.0	1.9
Morgan Offshore Wind Farm: Generation Assets	1.2 (1.2)	0.1 (0.2)	0.0 (0.0)	1.4 (1.5)
Scenario Totals				
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects				**156.9 (156.9)**

A.2.5.2 As-built

Table A.25: Expected seasonal and annual collision mortality across relevant wind farms for gannet (all values represent no. of collisions) (rows in yellow show those projects for which estimates have been calculated in this report) (values in brackets are those calculated using SNCB parameters).

Project	Breeding	Post-breeding	Pre-breeding	Total
Tier 1				
Awel y Môr Offshore Wind Farm	10.9	2.5	0.0	13.4
Burbo Bank Offshore Wind Farm	0.4	0.1	0.1	0.5
Burbo Bank Extension Offshore Wind Farm	11.9	0.2	0.1	12.2
Erebus Floating Wind Demo	4.1	0.2	0.3	4.6
Gwynt y Môr Offshore Wind Farm	0.7	0.1	0.1	0.9
Mona Offshore Wind Farm	1.2	0.1	0.1	1.5
Ormonde Wind Farm	6.7	0.1	0.1	6.9
Robin Rigg Offshore Wind Farm	0.6	0.1	0.1	0.8
TwinHub (Wave Hub Floating Wind Farm)	15.0	4.4	6.8	26.1
Walney 1 & 2 Offshore Wind Farm	1.7	0.3	0.2	2.2
Walney (3 & 4) Extension Offshore Wind Farm	11.3	12.4	0.8	24.5
West of Duddon Sands Offshore Wind Farm	1.7	0.3	0.2	2.3
West of Orkney Windfarm	39.8	7.9	1.2	48.8
White Cross Offshore Windfarm	1.0	0.4	0.0	1.4
Tier 2				
Morecambe Offshore Wind Farm: Generation Assets	1.9	0.0	0.0	1.9
Morgan Offshore Wind Farm: Generation Assets	1.2 (1.2)	0.1 (0.2)	0.0 (0.0)	1.4 (1.5)
Scenario Totals				
Scenario 3: Morgan Offshore Wind Farm: Generation Assets, Transmission Assets, Tier 1, Tier 2, and Tier 3 projects				**149.3 (149.3)**

A.3 Displacement and collision

A.3.1 Kittiwake

A.3.1.1 HRA basis

Table A.26: Step 1 integrity test for the kittiwake feature of the Howth Head Coast SPA from the Morgan Generation Assets acting in combination with other projects/plans in relation to potential disturbance and displacement from airborne noise, underwater sound, and presence of vessels and infrastructure and collision risk impacts using consented turbine parameters, where available (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)			Seasonal apportioned collision impacts (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	0.020	0.002	0.002	9.5	0.3	0.8	0.3	0.0	0.0
Burbo Bank Offshore Wind Farm	0.027	0.002	0.002	0.2	0.0	0.0	0.0	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	0.027	0.002	0.002	35.2	0.4	0.3	0.5	0.0	0.0
Erebus Floating Wind Demo	0.033	0.002	0.002	0.1	3.1	1.0	0.0	0.0	0.0
Gwynt y Môr Offshore Wind Farm	0.027	0.002	0.002	0.9	0.1	0.1	0.2	0.0	0.0
Mona Offshore Wind Farm	0.018	0.002	0.002	6.4	0.9	1.8	0.1	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.027	0.002	0.002	70.1	3.9	1.1	0.1	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	0.027	0.002	0.002	13.5	1.8	1.6	0.2	0.0	0.0
Ormonde Wind Farm	0.027	0.002	0.002	1.6	0.0	0.0	0.0	0.0	0.0

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)			Seasonal apportioned collision impacts (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Rampion Offshore Wind Farm	No connectivity	0.002	0.002	-	0.7	0.8	0.0	0.0	0.0
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.002	0.002	-	0.1	0.6	0.0	0.1	0.0
Robin Rigg Offshore Wind Farm	0.027	0.002	0.002	4.3	0.0	0.1	0.0	0.0	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.002	0.002	-	0.2	0.0	-	0.0	0.0
Walney 1 & 2 Offshore Wind Farm	0.027	0.002	0.002	1.0	0.1	0.2	0.1	0.0	0.0
Walney (3 & 4) Extension Offshore Wind Farm	0.027	0.002	0.002	4.3	1.0	0.7	0.5	0.1	0.1
West of Duddon Sands Offshore Wind Farm	0.027	0.002	0.002	12.1	0.1	0.1	0.1	0.0	0.0
West of Orkney Windfarm	No connectivity	0.002	0.002	-	1.0	2.5	-	0.0	0.0
White Cross Offshore Windfarm	0.033	0.002	0.002	1.2	0.1	0.9	0.0	0.0	0.0
Annual total				**187.2**			**3.3**		

Table A.27: Step 1 integrity test for the kittiwake feature of the Howth Head Coast SPA from the Morgan Generation Assets acting in combination with other projects/plans in relation to potential disturbance and displacement from airborne noise, underwater sound, and presence of vessels and infrastructure and collision risk impacts using as-built turbine parameters (rows in yellow show those projects for which estimates have been calculated in this report).

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)			Seasonal apportioned collision impacts (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr Offshore Wind Farm	0.020	0.002	0.002	9.5	0.3	0.8	0.3	0.0	0.0
Burbo Bank Offshore Wind Farm	0.027	0.002	0.002	0.2	0.0	0.0	0.0	0.0	0.0
Burbo Bank Extension Offshore Wind Farm	0.027	0.002	0.002	35.2	0.4	0.3	0.5	0.0	0.0
Erebus Floating Wind Demo	0.033	0.002	0.002	0.1	3.1	1.0	0.0	0.0	0.0
Gwynt y Môr Offshore Wind Farm	0.027	0.002	0.002	0.9	0.1	0.1	0.1	0.0	0.0
Mona Offshore Wind Farm	0.018	0.002	0.002	6.4	0.9	1.8	0.1	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.027	0.002	0.002	70.1	3.9	1.1	0.1	0.0	0.0
Morgan Offshore Wind Farm: Generation Assets	0.027	0.002	0.002	13.5	1.8	1.6	0.2	0.0	0.0
Ormonde Wind Farm	0.027	0.002	0.002	1.6	0.0	0.0	0.0	0.0	0.0
Rampion Offshore Wind Farm	No connectivity	0.002	0.002	-	0.7	0.8	0.0	0.0	0.0
Rampion 2 (Rampion Extension) Offshore Wind Farm	No connectivity	0.002	0.002	-	0.1	0.6	0.0	0.1	0.0

Project	Seasonal apportioning values			Seasonal abundance values (no. of birds)			Seasonal apportioned collision impacts (no. of collisions)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Robin Rigg Offshore Wind Farm	0.027	0.002	0.002	4.3	0.0	0.1	0.0	0.0	0.0
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	0.002	0.002	-	0.2	0.0	-	0.0	0.0
Walney 1 & 2 Offshore Wind Farm	0.027	0.002	0.002	1.0	0.1	0.2	0.1	0.0	0.0
Walney (3 & 4) Extension Offshore Wind Farm	0.027	0.002	0.002	4.3	1.0	0.7	0.5	0.1	0.1
West of Duddon Sands Offshore Wind Farm	0.027	0.002	0.002	12.1	0.1	0.1	0.1	0.0	0.0
West of Orkney Windfarm	No connectivity	0.002	0.002	-	1.0	2.5	-	0.0	0.0
White Cross Offshore Windfarm	0.033	0.002	0.002	1.2	0.1	0.9	0.0	0.0	0.0
Annual total				**187.2**			**3.1**		

Appendix B: Offshore Ornithology Cumulative Effects Assessment And In-Combination Gap-Filling Historical Projects Note

B.1 Background and aims

B.1.1.1.1 This note has been developed collectively by the Mona Offshore Wind Project (hereafter referred to as 'Mona') and Morgan Offshore Wind Project: Generation Assets (hereafter referred to as 'Morgan Generation'). These two projects will hereafter be referred to collectively as 'the Projects', whilst the Applicant of each project will be referred to collectively as 'the Applicants'.

B.1.1.1.2 This note follows a technical note (Titled: Cumulative Effects Assessment and In-combination Historical Projects Note – Environmental Statement and Habitat regulations assessments approach) that was prepared by the Applicants in relation to the Projects to outline the approach taken at application(s) for quantifying impacts from historical offshore wind projects for which quantitative analyses were not undertaken. The technical note outlining the approach taken at application was developed in conjunction with the Morecambe Generation Assets Offshore Wind Project. This offshore ornithology cumulative effects assessment and in-combination gap-filling historical projects note has been developed in relation to the Projects only in response to relevant representations from the Statutory Nature Conservation Bodies (SNCBs).

B.1.1.1.3 As part of the Evidence Plan Process the Projects circulated, prior to the respective DCO applications, the technical note titled Cumulative Effects Assessment (CEA) and In-combination Historical Projects Note – Environmental Statement and Habitat regulations assessments approach to the SNCBs (emailed on 26 January 2024). In short, this previous technical note set out that the approach taken in the DCO applications was robust, precautionary, and provided sufficient detail to conclude no significant effects within the Environmental Statements or no adverse effect on site integrity (AEOI) beyond reasonable scientific doubt for the purposes of the Habitats Regulations Assessments (HRAs) undertaken for each of the Projects. The technical note also stated that the assessments undertaken for the Projects were consistent with the information provided in similar recent offshore wind applications.

B.1.1.1.4 Since submission of the relevant DCOs, Relevant Representations from Natural England (RR-026 for Morgan Generation), Natural Resources Wales (NRW) (RR-011 for Mona and RR-027 for Morgan Generation) and Joint Nature Conservation Committee (JNCC) (RR-033 for Mona), commented that the qualitative assessments included in Volume 2, Chapter 5: Offshore ornithology (APP-057 for Mona and APP023 for Morgan Generation) do not adequately account for the impacts from historical projects and that quantitative assessments are required.

B.1.1.1.5 The Applicant notes that a quantitative assessment of historical projects was originally tendered by Natural England as a strategic project but has not been awarded and completed in time for the Mona and Morgan DCO applications and examinations. This was acknowledged in the sixth Expert Working Group (EWG) meeting on 16 October 2023. The Applicant notes NRW's relevant representation (RR-011) states "There are ongoing internal discussions surrounding the development of an approach that may help to address this issue, which will be shared with the Applicant for consideration in due course". The Applicant is continuing to engage with NRW to understand any proposals forthcoming from NRW;

however, the Applicant considers that the quantitative assessment approach using the methodology recommended by the SNCBs in an advice note provided to the Applicants on 16 October 2023 provides the required information in order to resolve this outstanding concern.

B.1.1.1.6 The Applicants consider that the qualitative assessments presented at application are a valid presentation of the potential risks from historical projects (Volume 2, Chapter 5: Offshore ornithology (APP-057 for Mona and APP-023 for Morgan Generation)) due to the very small number of birds involved. It is further considered that the approach set out in this note is above and beyond the requirements for a robust application and exceeds information provided for other recently consented offshore wind farm projects in the region and Plan Level HRAs; but provides the information requested by SNCBs (i.e. 'indicative estimates' for currently unquantified impacts from historical projects).

B.1.1.1.7 This note presents a quantitative assessment approach, using the methodology recommended by the SNCBs in an advice note provided to the Applicants on 16 October 2023 to generate indicative numbers for currently unquantified impacts from historical offshore wind farm projects.

B.2 Advice given by SNCBs during Statutory Consultation and the Evidence Plan Process

B.2.1.1.1 During the Statutory Consultation on the Mona Preliminary Environmental Impact Report (PEIR) and the Morgan Generation PEIR, NRW, JNCC and Natural England did not consider it appropriate to base the cumulative (and hence also in-combination) assessments on a number of 'unknowns' for impacts from some historical offshore wind projects. They outlined that whilst these historical projects may not have undertaken quantitative assessments or assessments using current approaches, "indicative estimates" should be generated for these historical projects.

B.2.1.1.2 During the pre-application phases for the Projects, Natural England provided advice within an advice note on 16 October 2023 on 'gap filling' for historical offshore wind projects, where fully quantitative assessments have not been provided. NRW and JNCC agreed to the methods presented within Natural England's advice note during the seventh EWG meeting on 08 December 2023. Similarly, both JNCC and NRW, as part of their relevant representations to Mona Offshore Wind Project, refer to the advice received as "SNCB advice"; hereafter, the advice note is referred to as the 'SNCB Advice Note'. NRW, JNCC and Natural England suggested that the approach to assessing the historical projects should continue to be explored collaboratively through any additional offshore ornithology EWGs.

B.2.1.1.3 The SNCB Advice Note sets out the following:

"Natural England do not consider that AEOI can be ruled out beyond reasonable scientific doubt for several species/SPA combinations at Round 4 Irish Sea projects. This is due in part to a lack of appropriate consideration of impacts arising from preexisting OWFs. This presents a clear consenting risk and would ideally be resolved prior to examination. Natural England consider that some estimate of impact must be attributed to all projects screened in to cumulative and in-combination assessments to reduce or eliminate this risk which arises in some cases simply from a lack of provision of relevant information."

B.2.1.1.4 The SNCB Advice Note recommended the following approach to estimate displacement and collision impacts from the relevant projects.

Displacement

1. Review the submitted environmental statement. It is accepted that displacement mortality estimates may not be presented. However, if there is abundance data, utilise this to populate project-specific displacement matrices for relevant species. We also suggest review of the Round 4 plan-level HRA to determine if any suitable estimates are presented therein.

If no abundance data available…

2. Use a nearby windfarm with a published estimate of mortality arising from displacement as a proxy. Scale this estimate according to the relative area of the two arrays and appropriate buffers.

Collision

1. Review the submitted environmental statement. It is accepted that collision mortality estimates may not be presented. However, if there is abundance data, utilise this to run project-specific CRMs according to current best practice for relevant species. We also suggest review of the Round 4 plan-level HRA to determine if any suitable estimates are presented therein.

If no abundance data available…

2. Use a nearby windfarm with a published estimate of mortality arising from collision as a proxy. Scale this estimate according to the relative number of turbines in the two arrays. The difference in the turbine specifications should be considered to determine if this method is likely to over or underestimate impact.

If a more rigorous assessment is considered necessary, the best available bird density estimates and known array footprint + buffers and consented turbine parameters should be used to generate refined project specific assessments of displacement and collision mortality. If baseline characterisation data are not available for a given “gap-filling” project, MERP, strategic VAS of OWF areas, or the recent Welsh Atlas data could be considered (links and references available on request).

B.2.1.1.5 The SNCB Advice Note states, “*it is acknowledged that the approach detailed below* [in the SNCB Advice Note] *is flawed*”. The flawed nature of the SNCBs recommended approach (i.e. using proxies) meant that the Applicants decided to undertake a “*more rigorous assessment*” to gap-fill historical projects. Using a more rigorous approach provides additional robustness and repeatability to the assessment and is considered the best way to address the gaps.

B.2.1.1.6 The Applicants' initial assessment of proxies found very high levels of variation presented within the site-specific data of nearby wind farms. In addition, the results of recent surveys (e.g. for Awel y Môr) are highly likely to have been impacted by the presence of two historical projects nearby (in this instance Gwynt y Môr and Rhyl Flats). Having already constructed offshore wind farms within a survey area is highly likely to impact the distribution and abundance of seabirds; therefore, it is not considered appropriate to use such schemes as a proxy.

B.2.1.1.7 In addition, seabird species show high levels of interannual variation in distribution and movement patterns. To account for this high level of interannual variation, the current offshore wind farm guidance (Parker *et al.*, 2022) requires two consecutive years of data. Several of the older offshore wind farms which could be used as a proxy due to having site-specific data, only undertook surveys over a single year or single bio-season (e.g. breeding), and therefore, use of this data would not accord with current best practice guidance.

B.2.1.1.8 After considering the use of proxies, the ornithological consultants for the Projects concluded that there is no pragmatic or consistent way to use proxy wind farms, and therefore, this approach has not been pursued further.

B.2.1.1.9 It was considered more appropriate to use the data outputs of the Marine Ecosystems Research Programme (MERP) (Waggitt *et al.*, 2020) (hereafter referred to as MERP data), as recommended by the SNCBs. The MERP data produces average density estimates at a 10x10 km grid square resolution of the entire north east Atlantic using data from aerial and boat-based surveys from 1980 to 2018. This large temporal and spatial coverage represents the best available data within this area. The ability to use a published source of data also removes potential differences in reproduction and analysis of the data.

B.3 Applicants' proposed approach to cumulative/in-combination assessments for gap-filling historical offshore wind farm projects

B.3.1 Species to be considered for gap-filling historical offshore wind farm projects.

B.3.1.1.1 The Applicants' approach is to gap-fill projects for species for which the lack of quantification in the CEAs of the Environmental Statements and the in-combination assessments of the HRAs could result in an under-estimation of the cumulative effects (i.e. displacement and collision).

B.3.1.1.2 The Applicants are proposing to gap-fill historical projects for species assessed in the Environmental Statements for the Projects (Table B.1).

Table B.1: List of species and justification for whether they have been considered in the gap-filling exercise for each Project.

Species	Mona	Morgan Generation
Common scoter (for disturbance and displacement)	**No** – sufficient information is available from existing projects to enable robust assessment to be undertaken.	**No** – species not considered in assessments due to no connectivity and no birds recorded during baseline surveys
Red-throated diver	**No** – sufficient information is available from existing projects to enable robust assessment to be undertaken.	**No** – species not considered in assessments due to no connectivity and no birds recorded during baseline surveys
Atlantic puffin (for disturbance and displacement)	**No** – species only present in low numbers during site-specific surveys and therefore the likelihood of a significant impact occurring was considered to be negligible	**No** – species only present in low numbers during site-specific surveys and therefore the likelihood of a significant impact occurring was considered to be negligible
Black-legged kittiwake (for disturbance and displacement, and collision risk)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner	**Yes** – species considered for one or more SPAs within the Integrity test: Step 2 of the ISAA. Morgan Generation Assets also contribute to existing cumulative impact in a measurable manner

Species	Mona	Morgan Generation
Common guillemot (for disturbance and displacement)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner	**Yes** – species considered for one or more SPAs within the Integrity test: Step 2 of the ISAA. Morgan Generation Assets also contribute to existing cumulative impact in a measurable manner
Great black-backed gull (for collision risk)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner	**Yes** – species considered for one or more SPAs within the Integrity test: Step 2 if the ISAA. Morgan Generation Assets also contribute to existing cumulative impact in a measurable manner
Herring gull (for collision risk)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner	**Yes** – species considered for one or more SPAs within the Integrity test: Step 2 of the ISAA. Morgan Generation Assets also contribute to existing cumulative impact in a measurable manner
Lesser black-backed gull (for collision risk)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner	**Yes** – Morgan Generation Assets contribute to existing cumulative impact in a measurable manner
Manx shearwater (for disturbance and displacement)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner.	**Yes** – Morgan Generation Assets contribute to existing cumulative impact in a measurable manner
Northern fulmar (for collision risk)	**No** – Mona not considered to materially contribute to existing cumulative impact.	**No** – Morgan Generation Assets not considered to materially contribute to existing cumulative impact
Northern gannet (for disturbance and displacement, and collision risk)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner.	**Yes** – Morgan Generation Assets contribute to existing cumulative impact in a measurable manner
Razorbill (for disturbance and displacement)	**Yes** – Mona contributes to existing cumulative impact in a measurable manner.	**Yes** – Morgan Generation Assets contribute to existing cumulative impact in a measurable manner

B.3.2 Cumulative displacement

B.3.2.1.1 It is the Applicants' position that in order to provide the quantitative gap filling requested by SNCBs, a rigorous assessment with the best available bird density estimates should be used to generate "indicative estimates" of displacement.

B.3.2.1.2 This aligns with the advice provided by the SNCBs on 16 October 2023 on 'gap filling' for historical offshore wind projects.

B.3.2.1.3 If baseline characterisation data from project-specific documentation are not available for a given historical project or are not considered robust enough to allow for the calculation of impacts, baseline data on seabird distribution from the MERP (Waggitt *et al.*, 2020) as specified by the SNCB Advice Note, would be used.

B.3.2.1.4 The Applicants consider the MERP data to be the best evidence available to characterise baseline abundance given its spatial coverage (the northeast Atlantic) and extensive temporal coverage (1980 and 2018). Using a dataset which covers almost 40 years will allow for interannual variation to be less prominent and provided

an indication of average density within the area of interest. It should be noted that the publicly accessible MERP data represents relative and not absolute density estimates, and therefore, any predicted impacts presented are to be taken as relative and not absolute impacts. However, this is considered appropriate to provide the 'indicative' numbers as requested by the SNCBs.

B.3.2.1.5 Where project-specific documentation (e.g. the original Environmental Statement) indicates the absence or very low abundance of a species considered in 'gap-filing' exercise, there is no requirement to re-characterise the baseline using the MERP data as 'gap-filling' would not be undertaken in these instances. Furthermore, the Applicants will not seek to provide an assessment for any species that were not originally modelled in the project Environmental Statement (e.g. Manx shearwater from Rampion 2 Wind Farm).

B.3.2.1.6 As parameters used in the displacement matrices modelling (e.g. displacement and mortalities rates) may differ between applications, each of the Projects will undertake its own modelling based on the agreed abundance data.

B.3.3 Cumulative collision

B.3.3.1.1 Similarly to displacement, the Applicants' position is that if a quantitative gap filling is required, a rigorous assessment using the best available bird density estimates should be used to generate "indicative estimates" of collision.

B.3.3.1.2 Project-specific collision risk models for historical offshore wind farm projects would be re-run where data is not available from those projects (as advised by the SNCBs in section B.2). This would allow for an estimate to be generated which can be used to compare and contextualise the approach taken within the CEA of the Environmental Statement submitted for the Projects.

B.3.3.1.3 Where abundance data are not available from project-specific documentation, baseline data on seabird distribution from the MERP (Waggitt *et al*., 2020) will be used. It is noted that there is no predicted density estimate for great black-backed gull within the MERP data. Therefore, a different data source is proposed to quantify the density of this species within the Irish Sea. As agreed between ornithological consultants for Mona and Morgan Generation, the Seabird Mapping and Sensitivity Tool (SeaMaST) has been identified as the most appropriate due to its spatial and temporal coverage (Bradbury *et al*., 2014).

B.3.3.1.4 As only the 'all behaviour data' are publicly available from MERP, correction factors will be applied to derive densities of birds in flight. Species correction factors calculated from the proportion of birds flying vs. other behaviours present within the Mona, Morgan Generation and Morecambe Generation survey areas (based on an annual average for the three projects) will be used. These three projects were chosen as the three more recent digital aerial survey campaigns within the region, which cover a large proportion of the Irish Sea. This approach uses Digital Aerial Survey data which presents the proportion of flying vs. other behaviour more accurately than boat-based surveys.

B.3.3.1.5 Similar to the displacement approach, where project-specific documentation (e.g. the original Environmental Statement) indicates the absence or very low abundance of a species considered in this 'gap-filing' exercise, the Applicants will not seek to recharacterise the baseline using the MERP data and undertake an assessment of collision risk. Similarly, if the Environmental Statement (or other document) considered that collision risk modelling was not required (e.g. lesser black-backed gull from Awel y Môr), no new assessment will be undertaken.

B.3.3.1.6 As parameters used in the collision risk models (e.g. avoidance rates or flight speeds) may differ between applications, each of the Projects will undertake its own modelling based on the jointly agreed abundance data.

B.3.3.1.7 Collision risk models using abundance estimates (from project-specific documentation and MERP) will be run deterministically using the sCRM developed by Marine Scotland (McGregor *et al*., 2018). The user guide for the sCRM Shiny App provided by Marine Scotland (Donovan, 2017)5 will be followed for the modelling of collision impacts predicted for each historical project.

B.3.4 Wind farm/turbine parameters and consented scenario

B.3.4.1.1 The SNCB Advice Note stated that the consented turbine parameters should be used to generate refined project-specific assessments of displacement and collision mortality. The Applicants have used consented parameters when these have been available, but some wind farm documents only provide as-built scenarios (e.g. Robin Rigg). Where there is no information on the consented wind farm turbine parameters the as-built parameters will be used.

B.3.4.1.2 The wind turbine parameters would be sourced using the MacArthur Green database (The Crown Estate, 2019). This database provides a summary of offshore ornithological collision risk modelling data for all UK offshore wind farms.

B.3.4.1.3 The SNCB Advice Note also stated that “it would be appropriate to consider timelines and determine if any of these sites can be screened out”. A full breakdown of the wind farms considered and the parameters used will be presented alongside the results of this exercise in a separate document, which will be shared with the relevant SNCBs in due course.

B.3.4.1.4 The updated values for as-built scenarios (where possible) will be presented alongside the consented values for comparative purposes only. This will highlight the scenario with the greatest risk and allow stakeholders to validate the conclusion of the quantitative and qualitative CEA presented in the Project Environmental Statements.

B.3.5 Presentation of results

B.3.5.1.1 The impacts of displacement and collision calculated using abundance estimates (from project-specific documentation and MERP) will be presented.

B.3.5.1.2 The implications of including impacts from the gap-filled historical projects will be presented for the selected species shown in Table 1.

B.3.5.1.3 This will allow stakeholders to validate the conclusions of the quantitative and qualitative CEAs presented in the Project Environmental Statements and the in-combination assessment for both Projects.

B.3.5.1.4 If the numbers demonstrate that the ‘gap filled’ CEA could materially alter the conclusions of the assessment, the impact will be investigated further using the approaches applied in the Environmental Statement chapters for each project.

Appendix C: Density estimates used for collision risk modelling

C.1 Kittiwake

C.1.1.1.1 Monthly densities for kittiwake (not corrected for birds in flight) as used in collision risk modelling for the additional projects considered in this report are shown in Table C.1.

Table C.1: Monthly densities for kittiwake (not corrected for birds in flight) at the additional projects considered in this report.

Project	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Burbo Bank Offshore Wind Farm	0.43	0.45	0.30	0.18	0.17	0.15	0.13	0.12	0.20	0.33	0.37	0.40
Gwynt y Môr Offshore Wind Farm	0.42	0.44	0.31	0.21	0.19	0.17	0.15	0.13	0.20	0.33	0.36	0.40
Robin Rigg Offshore Wind Farm	0.45	0.46	0.32	0.21	0.20	0.18	0.17	0.16	0.24	0.38	0.40	0.43
Walney 1 Offshore Wind Farm	0.46	0.47	0.31	0.19	0.18	0.16	0.14	0.13	0.22	0.37	0.40	0.43
Walney 2 Offshore Wind Farm	0.47	0.49	0.33	0.20	0.19	0.17	0.15	0.14	0.23	0.38	0.41	0.45
West of Duddon Sands Offshore Wind Farm	0.46	0.47	0.31	0.19	0.18	0.16	0.14	0.13	0.22	0.36	0.40	0.43

C.2 Great black-backed gull

C.2.1.1.1 Monthly densities for great black-backed gull (not corrected for birds in flight) as used in collision risk modelling for the additional projects considered in this report are shown in Table C.2.

Table C.2: Monthly densities for great black-backed gull (not corrected for birds in flight) at the additional projects considered in this report.

Project	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Burbo Bank Offshore Wind Farm	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Burbo Bank Extension Offshore Wind Farm	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Gwynt y Môr Offshore Wind Farm	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Robin Rigg Offshore Wind Farm	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05
Walney 1 Offshore Wind Farm	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03
Walney 2 Offshore Wind Farm	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
West of Duddon Sands Offshore Wind Farm	0.02	0.02	0.02	0.04	0.04	0.04	0.04	0.04	0.02	0.02	0.02	0.02

C.3 Herring gull

C.3.1.1.1 Monthly densities for herring gull (not corrected for birds in flight) as used in collision risk modelling for the additional projects considered in this report are shown in Table C.3.

Table C.3: Monthly densities for herring gull (not corrected for birds in flight) at the additional projects considered in this report.

Project	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Burbo Bank Offshore Wind Farm	0.24	0.26	0.26	0.24	0.20	0.15	0.12	0.10	0.11	0.13	0.16	0.20
Gwynt y Môr Offshore Wind Farm	0.22	0.24	0.24	0.22	0.18	0.14	0.11	0.10	0.10	0.12	0.15	0.19
Robin Rigg Offshore Wind Farm	0.29	0.32	0.44	0.53	0.45	0.35	0.27	0.16	0.12	0.15	0.19	0.24
Walney 1 Offshore Wind Farm	0.46	0.47	0.31	0.19	0.18	0.16	0.14	0.13	0.22	0.37	0.40	0.43
Walney 2 Offshore Wind Farm	0.47	0.49	0.33	0.20	0.19	0.17	0.15	0.14	0.23	0.38	0.41	0.45
West of Duddon Sands Offshore Wind Farm	0.46	0.47	0.31	0.19	0.18	0.16	0.14	0.13	0.22	0.36	0.40	0.43

C.4 Lesser black-backed gull

C.4.1.1.1 Monthly densities for lesser black-backed gull (not corrected for birds in flight) as used in collision risk modelling for the additional projects considered in this report are shown in Table C.4.

Table C.4: Monthly densities for lesser black-backed gull (not corrected for birds in flight) at the additional projects considered in this report.

Project	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Robin Rigg Offshore Wind Farm	0.03	0.03	0.07	0.18	0.22	0.28	0.35	0.17	0.07	0.06	0.04	0.04

C.5 Gannet

C.5.1.1.1 Monthly densities for gannet (not corrected for birds in flight) as used in collision risk modelling for the additional projects considered in this report are shown in Table C.5.

Table C.5: Monthly densities for gannet (not corrected for birds in flight) at the additional projects considered in this report.

Project	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Burbo Bank Offshore Wind Farm	0.05	0.05	0.06	0.07	0.08	0.10	0.12	0.13	0.13	0.10	0.07	0.06
Gwynt y Môr Offshore Wind Farm	0.07	0.06	0.07	0.09	0.11	0.13	0.15	0.16	0.16	0.12	0.09	0.07
Robin Rigg Offshore Wind Farm	0.05	0.05	0.06	0.08	0.10	0.12	0.15	0.17	0.17	0.12	0.07	0.06
Walney 1 Offshore Wind Farm	0.07	0.06	0.07	0.09	0.11	0.13	0.16	0.18	0.18	0.13	0.09	0.07
Walney 2 Offshore Wind Farm	0.07	0.07	0.08	0.10	0.12	0.14	0.17	0.19	0.19	0.14	0.10	0.08
West of Duddon Sands Offshore Wind Farm	0.07	0.06	0.07	0.09	0.11	0.13	0.16	0.17	0.17	0.13	0.09	0.07

Appendix D: Appendix to Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects – proportion of birds in flight

D.1 Introduction

D.1.1.1.1 In the Offshore Ornithology Cumulative Effects Assessment (CEA) and In-combination Gap-filling of Historical Projects note, the Applicant has utilised densities from the Marine Ecosystems Research Programme (MERP) dataset (Waggitt *et al.,* 2020) that represent birds in flight and birds sitting on the water. These densities have been used in collision risk modelling to provide collision risk estimates that incorporate both birds sitting on the water and birds in flight. As birds sitting on the water are not at risk of collision with turbines, the proportion that these birds represent of the total collision risk estimates needs to be removed before further analysis. The Applicant has achieved this by multiplying collision risk estimates by an annual proportion of birds in flight calculated from data associated with the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets.

D.1.1.1.2 As part of the Statutory Nature Conservation Body (SNCB) ornithology meeting (29 August 2024), the methodology and results of an earlier draft of the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note were presented to the SNCBs. The SNCBs, both in the meeting and in a written response following the meeting, requested that the Applicant investigate the variation in the proportions of birds in flight on a monthly and seasonal basis to determine if the use of an annual proportion is appropriate (Appendix E).

D.1.1.1.3 This note provides a comparison of the proportion of birds in flight calculated on annual, seasonal and monthly bases.

D.2 Methodology

D.2.1 Analysis approach

D.2.1.1.1 The average annual proportions of birds in flight applied in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note were calculated using the annual proportions from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets. To calculate these proportions, raw data from the Mona Offshore Wind Project and Morgan Generation Assets, and population estimates from the Morecambe Offshore Windfarm: Generation Assets were used with the proportions calculated for each project then averaged to provide the average annual proportions. The seasonal and monthly proportions calculated in this report have used the same datasets from these three projects. No weighting or other calculation steps were applied before calculating any of the average values as discussed in section D.2.2.

D.2.1.1.2 Annual, seasonal and monthly proportions of birds in flight have been calculated for kittiwake *Rissa tridactyla*, herring gull *Larus argentatus*, lesser black-backed gull *Larus fuscus* and gannet *Morus bassanus* with comparisons presented graphically for each species in section D.3.1. Density data for great black-backed gull was calculated using the SEAMAST dataset (Bradbury *et al.,* 2014) which provides individual datasets for birds in flight and on the water. A correction factor was therefore not required for this species.

D.2.1.1.3 Where the comparisons presented in section D.3.1 suggest that there may be some degree of variation in the proportions of birds in flight, further consideration of how the application of these proportions may affect collision risk estimates is provided in section D.3.2. This analysis, where necessary, uses the same collision risk estimates as used in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note.

D.2.2 Representativeness of data

D.2.2.1.1 When calculating the proportion of birds at collision height from site-specific survey data for use in collision risk modelling, a 100 record threshold has been recommended by Natural England (Natural England, 2013), Johnston and Cook (2016) and Cook *et al.* (2018) as being required in order to calculate a representative value. The same threshold has also been used when calculating the proportion of immature birds at a project (Ørsted, 2018a; Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057)) and where analysing flight directions of birds (Ørsted, 2018b; Volume 4, Annex 5.1: Offshore ornithology baseline characterisation (APP-053)). It is considered appropriate to apply this threshold to the total number of birds in the analysis undertaken in this report in order to also identify when the proportion of birds in flight may be representative of the behaviour of birds at each project.

D.3 Results

D.3.1 Temporal comparisons

D.3.1.1 Kittiwake

D.3.1.1.1 Figure D.1 presents the average proportion of birds in flight on a monthly basis when combining the birds in flight proportions from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets. Figure D.2 provides a similar comparison but with data presented on a seasonal basis. The sample sizes presented in Figure D.1 and Figure D.2 are a combination of the raw data from the Mona Offshore Wind Project and the Morgan Generation Assets. Raw data is not available for the Morecambe Offshore Windfarm: Generation Assets and therefore further interpretation, which is provided in this section, is therefore required in order to understand whether the sample sizes surpass the 100 bird threshold discussed above to ensure the representative value of the data.

D.3.1.1.2 The 100 bird threshold is surpassed in all months and seasons. In some months the proportions show good correspondence with other months and the annual average proportion. However, there are some months that show a degree of variation (e.g. November and December) (Figure D.1). The seasonal dataset (Figure D.2) shows limited variation between seasons, with all seasons having proportions of 55-57%.

D.3.1.1.3 The high level of correspondence between the proportions of birds in flight in the majority of months and between seasons suggests that the use of an annual average is appropriate for kittiwake. Despite the limited variation observed, further consideration of the differences between the use of monthly, seasonal and annual proportions on collision risk estimates is provided in section D.3.2.

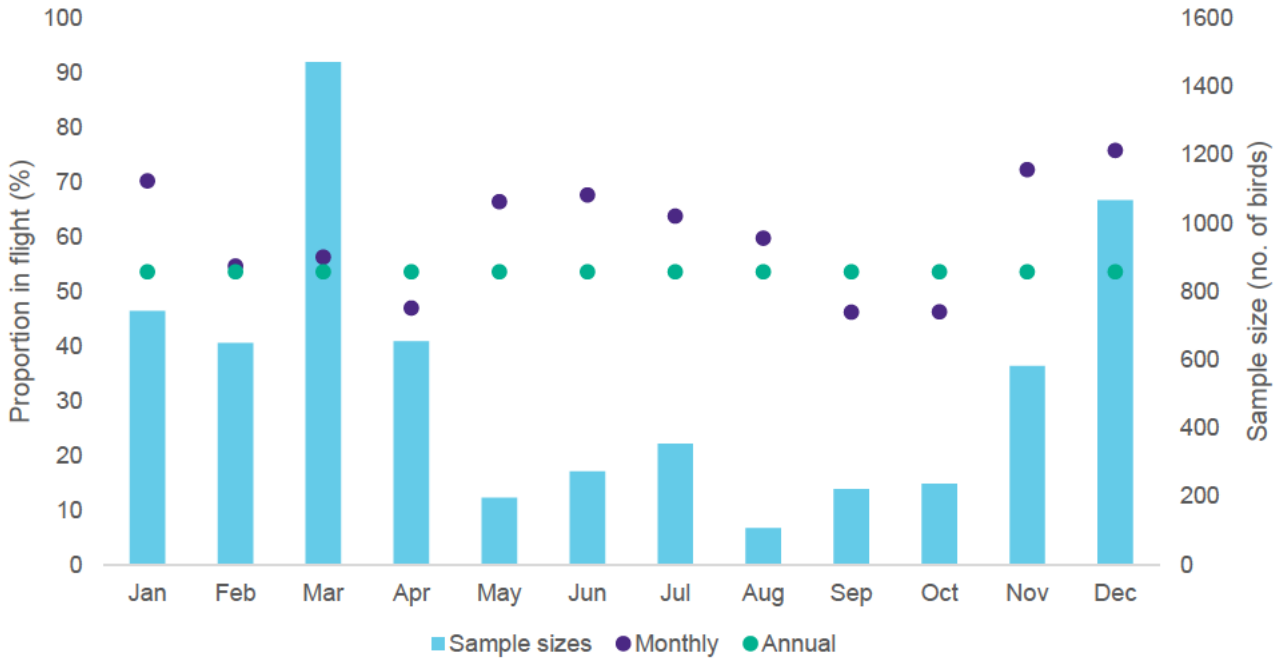

Figure D.1: Comparison between monthly and annual proportions of kittiwake in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

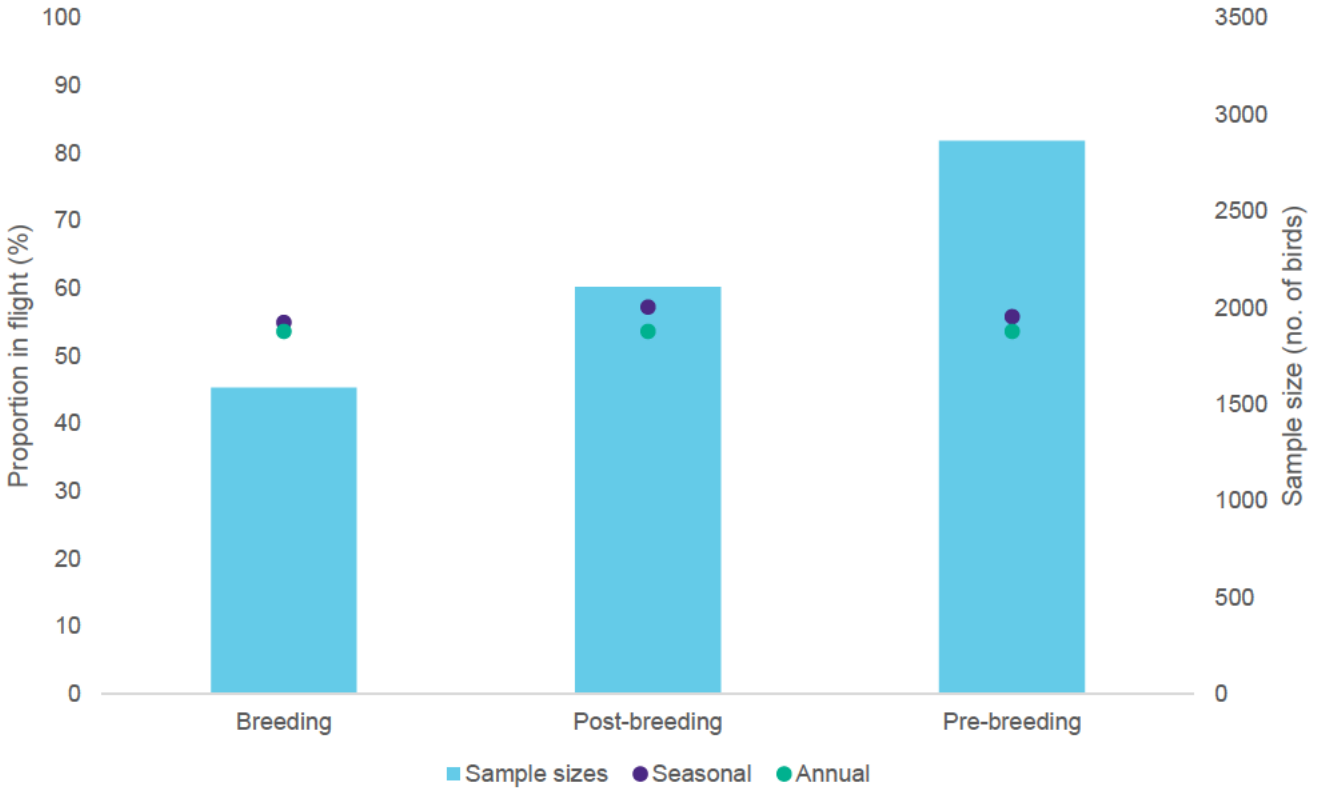

Figure D.2: Comparison between seasonal and annual proportions of kittiwake in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

D.3.1.2 Herring gull

D.3.1.2.1 Figure D.3 presents the average proportion of birds in flight on a monthly basis when combining the birds in flight proportions from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets. Figure D.4 provides a similar comparison but with data presented on a seasonal basis. The sample sizes presented in Figure D.3 and Figure D.4 are a combination of the raw data from the Mona Offshore Wind Project and Morgan Generation Assets and the population estimates from the Morecambe Offshore Windfarm: Generation Assets. Further interpretation, which is provided this section, is therefore required in order to understand whether the sample sizes surpass the 100 bird threshold discussed above.

D.3.1.2.2 The monthly sample sizes based on raw data from the Mona Offshore Wind Project and the Morgan Generation Assets do not surpass the 100 bird threshold (Figure D.3). This remains true for all but March, even if the Morecambe Offshore Windfarm: Generation Assets population estimates are included. In March, the contribution of the Mona Offshore Wind Project and Morgan Generation Assets is 88 birds. The population estimate from the Morecambe Offshore Windfarm: Generation Assets is 57 birds with the underlying raw data unlikely to contribute the required number of birds to surpass the 100 bird threshold when combined with the raw data from the Mona Offshore Wind Project and Morgan Generation Assets. Whilst there is a large degree of variation in the monthly proportions shown in Figure D.3 it is considered that this is not a reliable indication of the suitability of using an annual average.

D.3.1.2.3 The sample sizes associated with each season, calculated when using the raw data from the Mona Offshore Wind Project and the Morgan Generation Assets, do surpass the 100 bird threshold (Figure D.4). There is limited variation in the proportions of birds in flight between the breeding and non-breeding season suggesting that the use of an annual average is appropriate for herring gull.

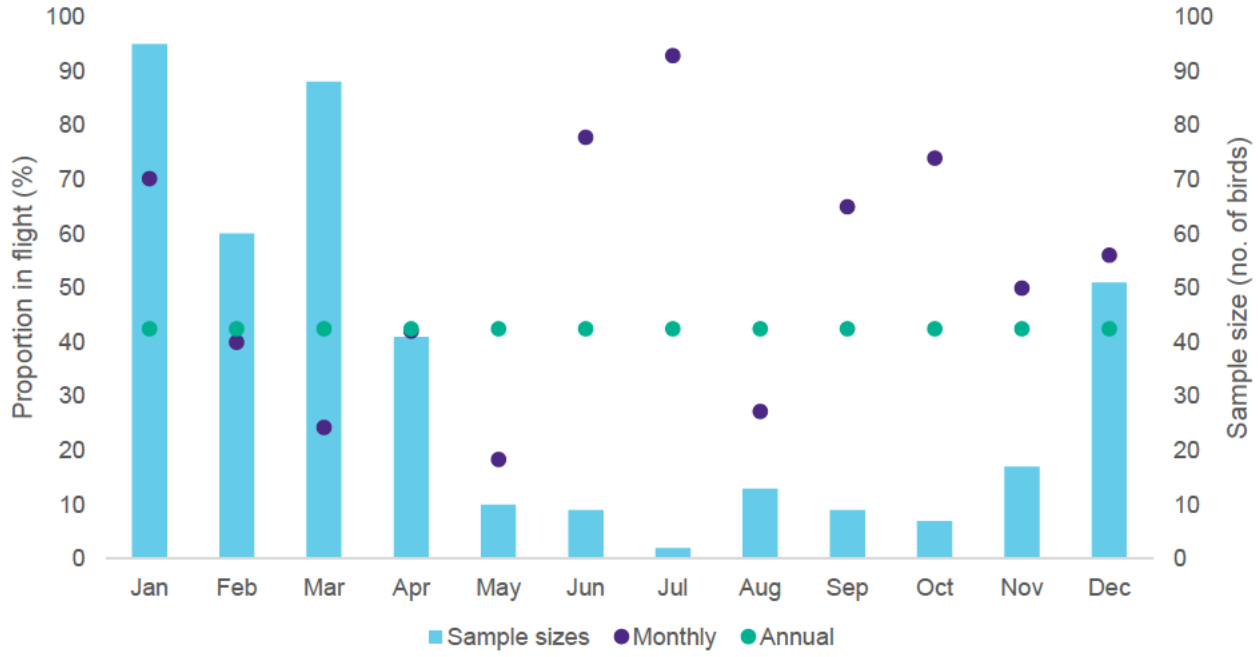

Figure D.3: Comparison between monthly and annual proportions of herring gull in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

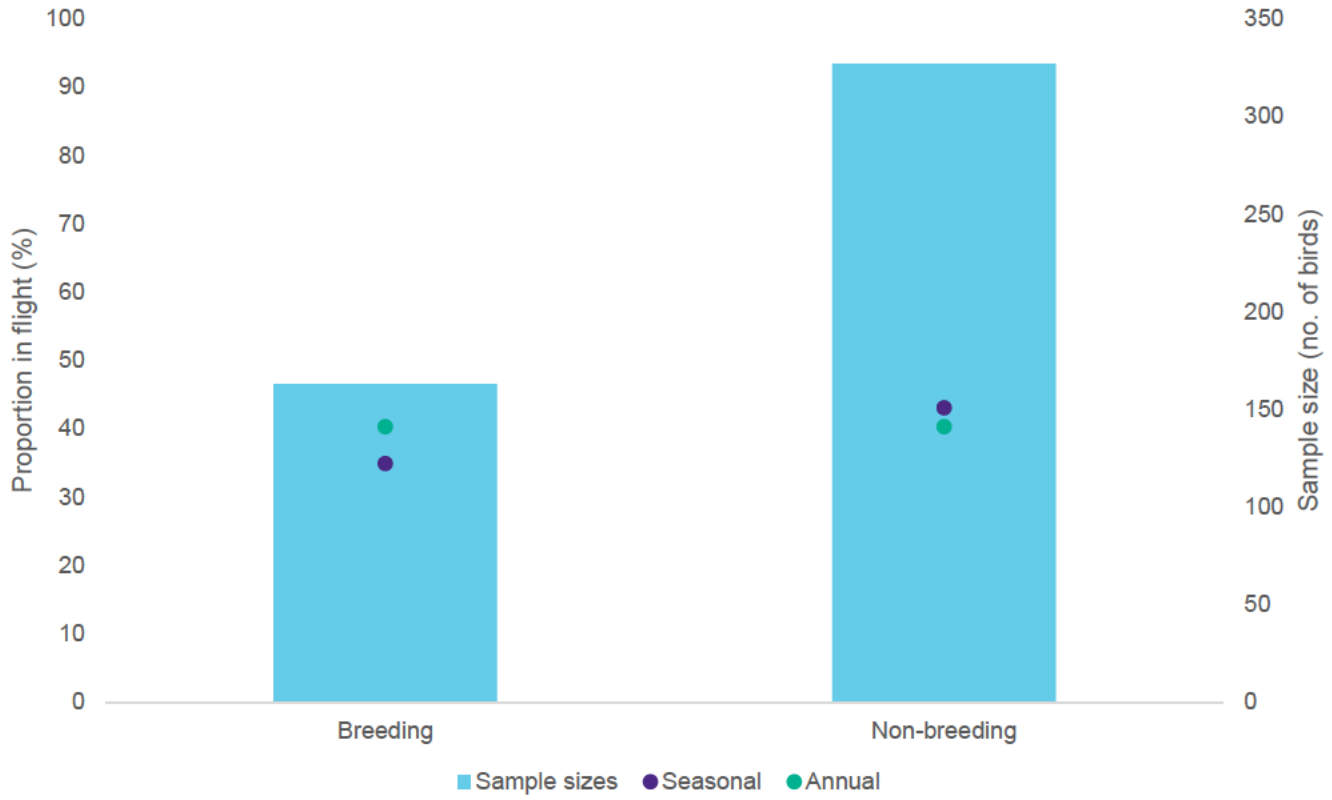

Figure D.4: Comparison between seasonal and annual proportions of herring gull in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

D.3.1.3 Lesser black-backed gull

D.3.1.3.1 Figure D.5 presents the average proportion of birds in flight on a monthly basis when combining the birds in flight proportions from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets. Figure D.6 provides a similar comparison but with data presented on a seasonal basis. The sample sizes presented in Figure D.5 and Figure D.6 are a combination of the raw data from the Mona Offshore Wind Project and Morgan Generation Assets and the population estimates from the Morecambe Offshore Windfarm: Generation Assets. Further interpretation, which is provided this section, is therefore required in order to understand whether the sample sizes surpass the 100 bird threshold discussed above.

D.3.1.3.2 The monthly sample sizes based on raw data from the Mona Offshore Wind Project and the Morgan Generation Assets do not surpass the 100 bird threshold (Figure D.5). This remains true even if the Morecambe Offshore Windfarm: Generation Assets population estimates are included. Whilst there is a large degree of variation in the monthly proportions shown in Figure D.5, which is skewed by the lack of birds in October and December, it is considered that this is not a reliable indication of the suitability of using an annual average.

D.3.1.3.3 The sample sizes associated with each season, based on raw data from the Mona Offshore Wind Project and the Morgan Generation Assets, do not surpass the 100 bird threshold (Figure D.6). This remains true for the post-breeding, non-breeding and pre-breeding seasons even if the population estimates associated with the Morecambe Offshore Windfarm: Generation Assets are included. In the breeding season, the raw data total from the Mona Offshore Wind Project and the Morgan Generation Assets is 75 birds. The population estimate associated with the Morecambe Offshore Windfarm: Generation Assets is 95 birds. It is therefore possible that, in the breeding season, the 100 bird threshold may be surpassed if the raw data from the Morecambe Offshore Windfarm: Generation Assets were available. In the breeding season there is limited deviation from the annual average however, due to the limited sample size in other seasons, comparisons between these and the breeding season are not considered representative. Therefore, whilst there is a large degree of variation in the monthly proportions shown in Figure D.6 it is considered that this is not a reliable indication of the suitability of using an annual average.

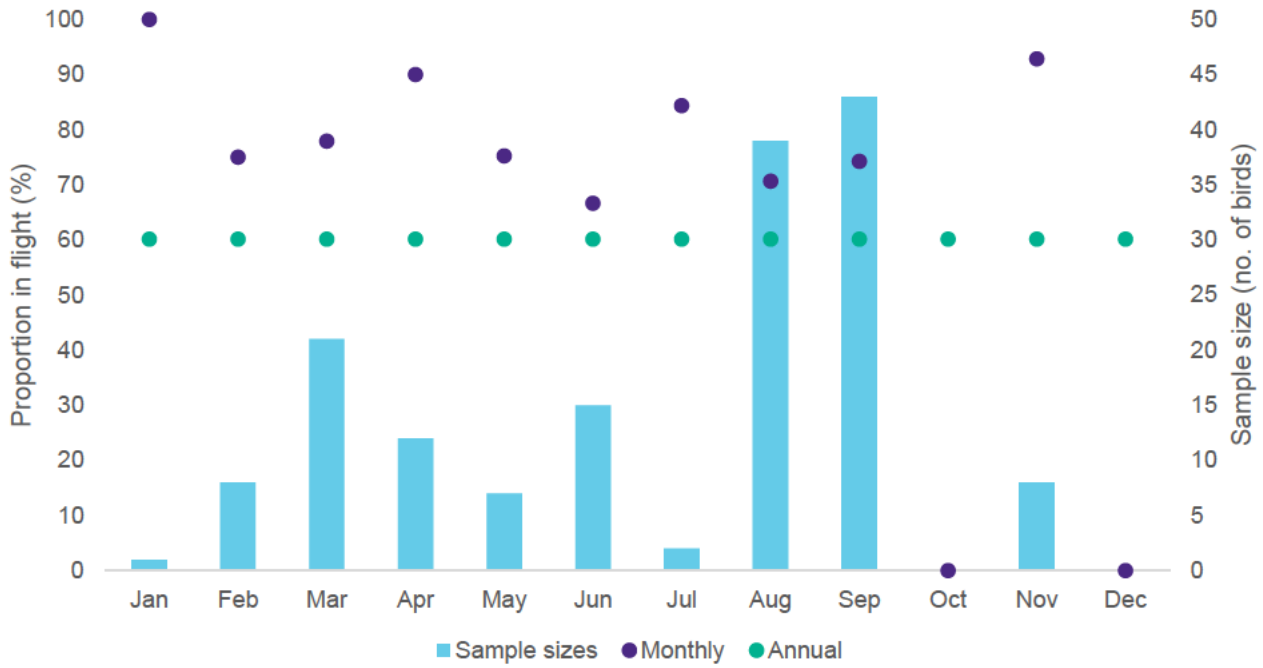

Figure D.5: Comparison between monthly and annual proportions of lesser black-backed gull in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

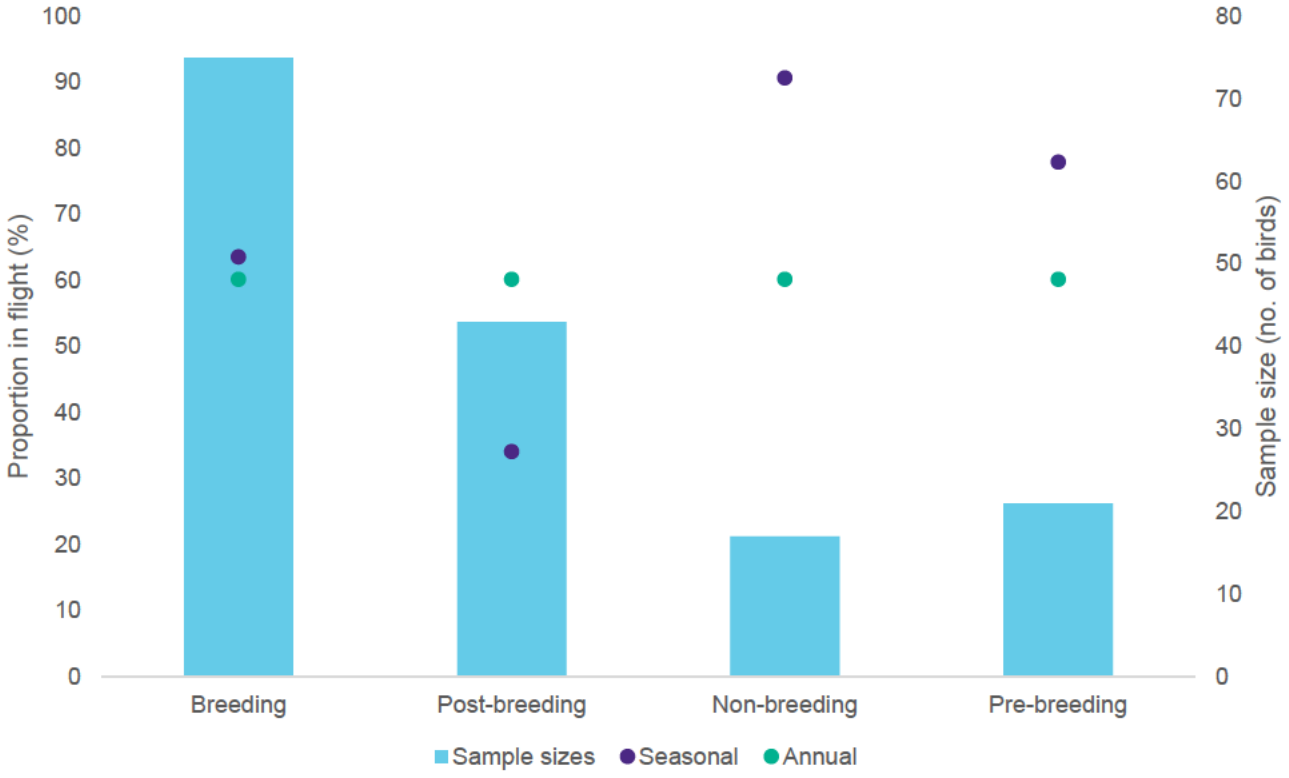

Figure D.6: Comparison between seasonal and annual proportions of lesser black-backed gull in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

D.3.1.4 Gannet

D.3.1.4.1 Figure D.7 presents the average proportion of birds in flight on a monthly basis when combining the birds in flight proportions from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets. Figure D.8 provides a similar comparison but with data presented on a seasonal basis. The sample sizes presented in Figure D.7 and Figure D.8 are a combination of the raw data from the Mona Offshore Wind Project and Morgan Generation Assets and the population estimates from the Morecambe Offshore Windfarm: Generation Assets. Further interpretation, which is provided this section, is therefore required in order to understand whether the sample sizes surpass the 100 bird threshold discussed above.

D.3.1.4.2 The 100 bird threshold was not surpassed in January, February, June, November and December when using the raw data from the Mona Offshore Wind Project and Morgan Generation Assets. In January, February, November and December, the number of birds remained below 100 even incorporating the Morecambe Offshore Windfarm: Generation Assets population estimates. In June, the 100 bird threshold was surpassed when incorporating the Morecambe Offshore Windfarm: Generation Assets population estimate. However, it increased to only 105 birds, suggesting that it would not be surpassed if using raw data from the Morecambe Offshore Windfarm: Generation Assets. In the months considered to have representative sample sizes, with the exception of April and September there was generally good correspondence both between months and with the annual average.

D.3.1.4.3 The sample sizes in the breeding and post-breeding season, calculated when using the raw data from the Mona Offshore Wind Project and the Morgan Generation Assets, surpass the 100 bird threshold (Figure D.4). No gannet were recorded at the Morecambe Offshore Windfarm: Generation Assets between December and February and therefore the threshold remains unsurpassed even with the inclusion of the Morecambe Offshore Windfarm: Generation Assets. There is a degree of variation in the proportions of gannet in flight between the breeding and post-breeding seasons. The breeding season shows good correspondence with the annual average with this driven by the contribution of the breeding season to the total number of gannet recorded.

D.3.1.4.4 The high level of correspondence between the proportions of birds in flight in the majority of months with representative sample sizes suggests that the use of an annual average is appropriate for gannet. However, the variation observed between seasons suggests otherwise. Further consideration of the potential implications this has for collision risk estimates is provided in section D.3.2.

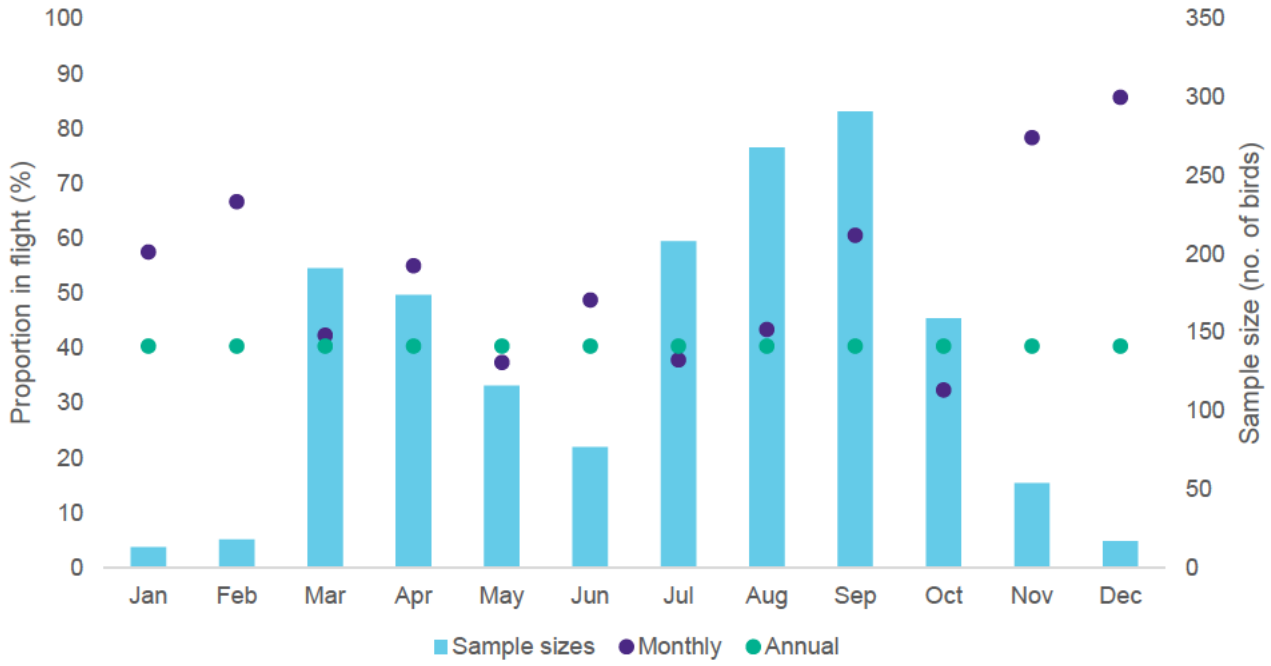

Figure D.7: Comparison between monthly and annual proportions of gannet in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

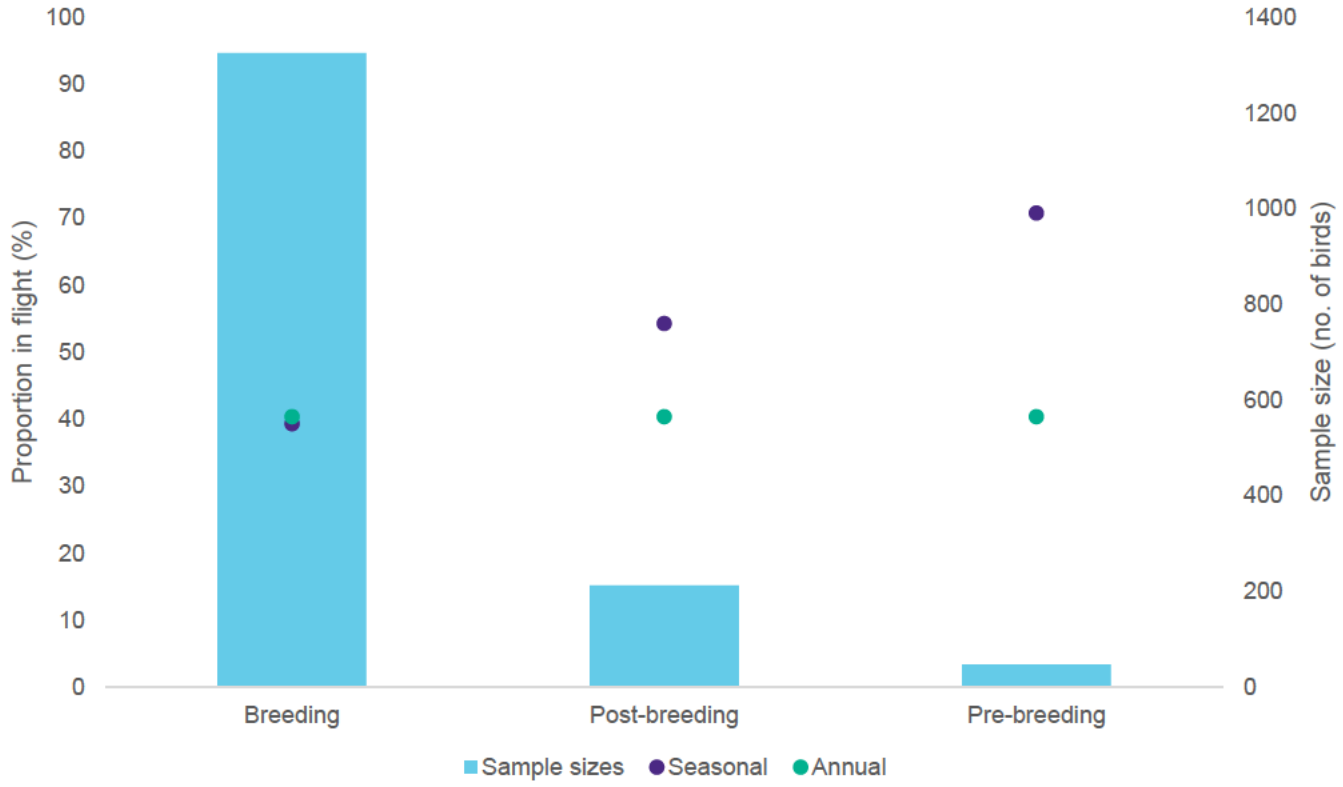

Figure D.8: Comparison between seasonal and annual proportions of gannet in flight with sample sizes calculated using raw data from the Mona Offshore Wind Project and Morgan Generation Assets.

D.3.2 Impact on collision risk estimates

D.3.2.1.1 The monthly proportions for kittiwake and gannet showed a degree of variation between months and when compared to the annual average.

D.3.2.1.2 The monthly and seasonal proportions for herring gull and lesser black-backed gull were not considered to be representative of bird flight behaviour. Therefore, the use of an annual proportion is the only viable option, and collision risk estimates for herring gull and lesser black-backed gull have not been re-calculated in this section.

D.3.2.2 Kittiwake

D.3.2.2.1 Collision risk estimates for kittiwake for the additional projects considered in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note have been recalculated using the monthly and seasonal proportions. The re-calculated collision risk estimates are presented alongside those calculated using a single annual proportion in Table D.1.

Table D.1: Annual collision risk estimates for kittiwake calculated using annual, seasonal and monthly proportions of birds in flight.

Project	Annual collision risk estimates calculated using different proportions		
	Annual	Seasonal	Monthly
Burbo Bank Offshore Wind Farm	1.98	2.07	1.96
Gwynt y Môr Offshore Wind Farm	32.58	34.07	32.15
Robin Rigg Offshore Wind Farm	3.70	3.87	3.68
Walney 1 Offshore Wind Farm	5.38	5.63	5.35
Walney 2 Offshore Wind Farm	5.00	5.18	4.61
Walney 1&2 Offshore Wind Farm	10.38	10.81	9.95
West of Duddon Sands Offshore Wind Farm	11.88	12.44	11.79

D.3.2.2.2 Annual collision risk estimates calculated using the seasonal proportions are marginally higher when compared to those calculated using the annual proportion. When using the monthly proportions, annual collision risk estimates are marginally lower than those calculated when using the annual proportion. Although there are minor differences in the collision risk estimates calculated using different proportional data, the scale of the changes is not considered to be of a magnitude that would materially alter the conclusions reached in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note.

D.3.2.2.3 The trend in monthly collision risk estimates tends to follow the same trend across all of the additional historical projects, with any differences generally occurring in winter months. An example of the trend is presented using the monthly collision risk estimates calculated using the annual, seasonal and monthly proportions for Burbo Bank Offshore Wind Farm in Figure D.9. Whilst the monthly collision risk estimates vary across the year, the majority of months have collision risk estimates lower than the corresponding collision risk estimates calculated when applying the seasonal and annual proportions.

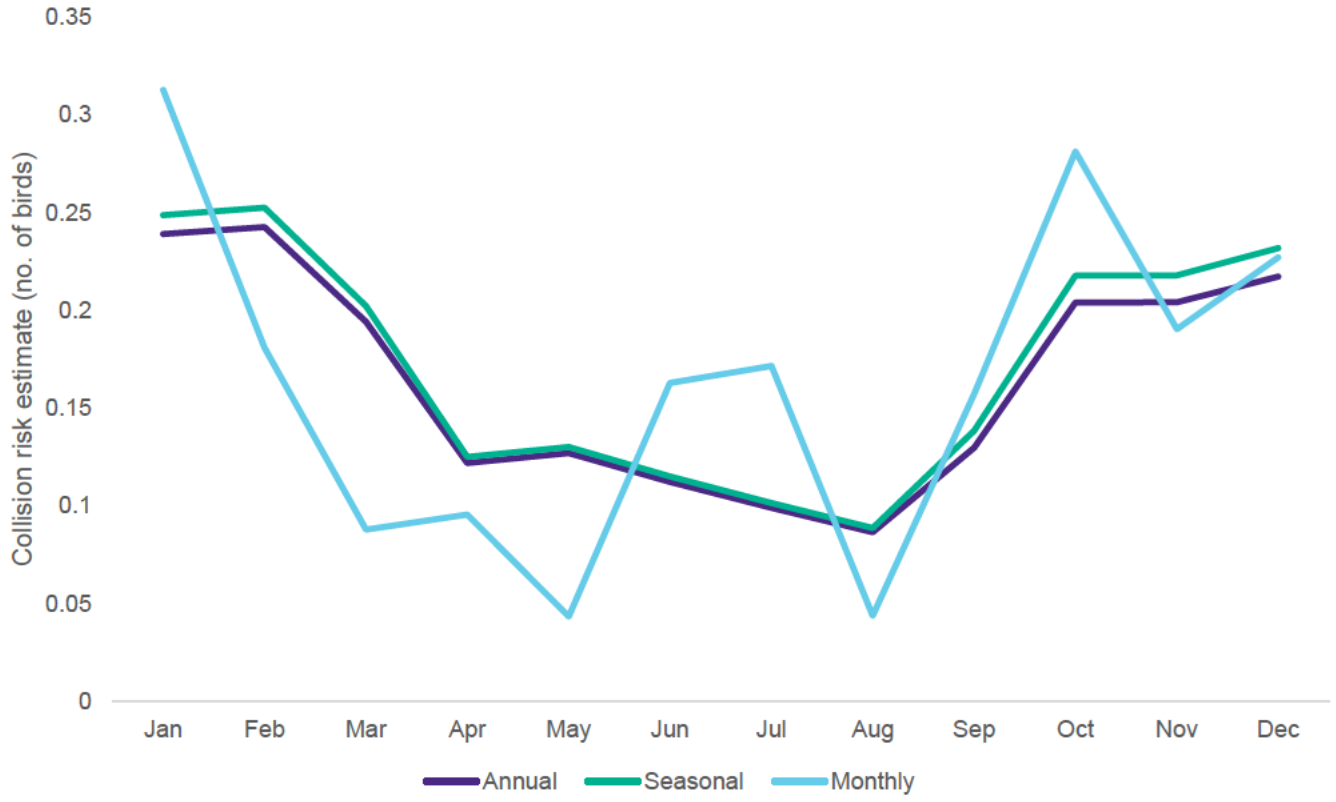

Figure D.9: Monthly collision estimates for kittiwake calculated using monthly, seasonal and annual proportions for birds in flight (based on Burbo Bank Offshore Wind Farm data as an example).

D.3.2.3 Gannet

D.3.2.3.1 Collision risk estimates for gannet for the additional projects considered in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note have been recalculated using the monthly and seasonal proportions. The re-calculated collision risk estimates are presented alongside those calculated using a single annual proportion in Table D.2.

D.3.2.3.2 Annual collision risk estimates calculated using the seasonal and monthly proportions are higher when compared to those calculated using the annual proportion. This difference is likely due to some months and seasons having a sample size considered to be too low to allow for the calculation of a representative proportion of birds in flight. Although there are differences in the collision risk estimates calculated using different proportional data, the changes are not considered to be of a magnitude that would materially alter the conclusions reached in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note.

Table D.2: Annual collision risk estimates for gannet calculated using annual, seasonal and monthly proportions of birds in flight.

Project	Annual collision risk estimates calculated using different proportions		
	Annual	Seasonal	Monthly
Burbo Bank Offshore Wind Farm	0.46	0.51	0.56
Gwynt y Môr Offshore Wind Farm	9.54	10.55	11.63

Project	Annual collision risk estimates calculated using different proportions		
	Annual	Seasonal	Monthly
Robin Rigg Offshore Wind Farm	0.88	0.96	1.06
Walney 1 Offshore Wind Farm	1.13	1.24	1.37
Walney 2 Offshore Wind Farm	1.30	1.43	1.58
Walney 1&2 Offshore Wind Farm	2.43	2.68	2.95
West of Duddon Sands Offshore Wind Farm	2.51	2.77	3.04

D.3.2.3.3 The trend in monthly collision risk estimates tends to follow the same trend across all of the additional historical projects. An example of the trend is presented using the monthly collision risk estimates calculated using the annual, seasonal and monthly proportions for Burbo Bank Offshore Wind Farm in Figure D.10. As would be expected there is a degree of variation, but all three datasets follow the same trend with the only real outlier being the monthly collision risk estimate calculated in September.

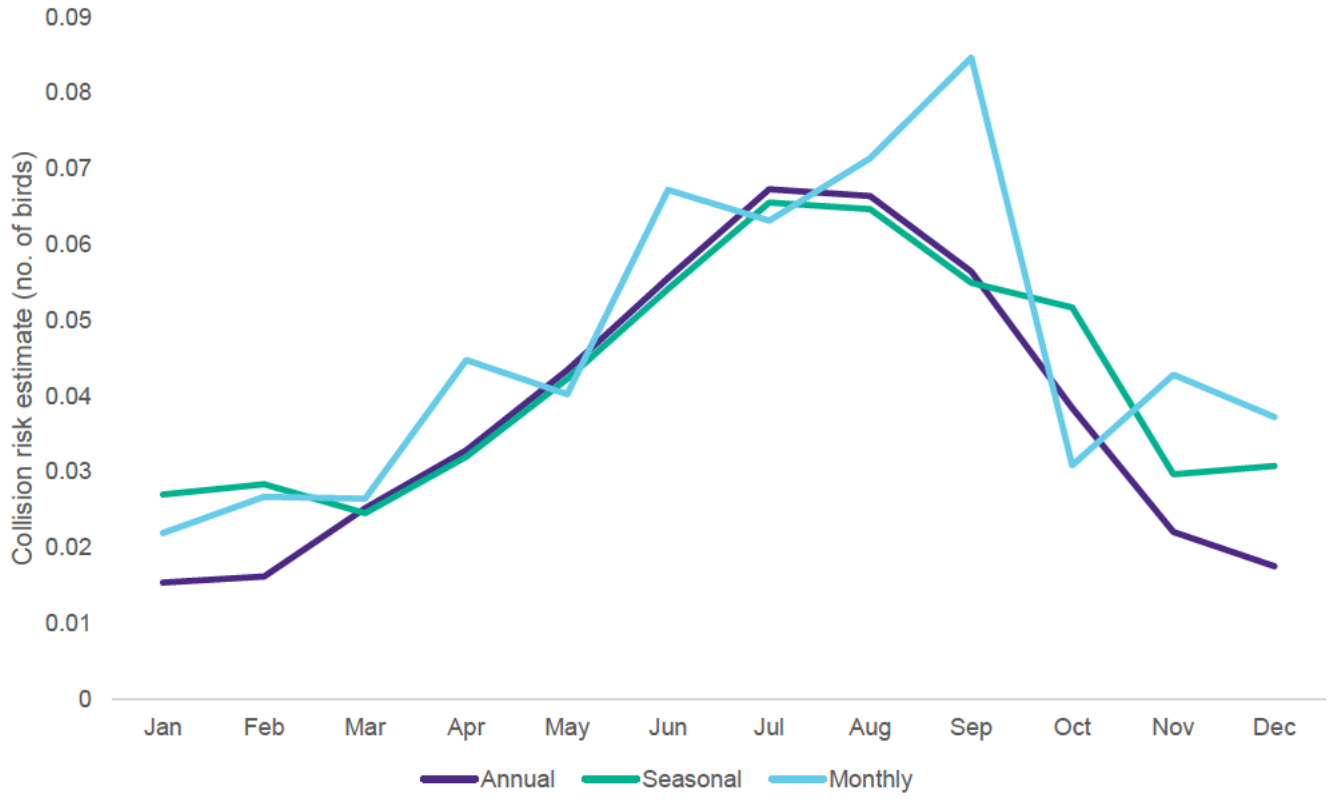

Figure D.10: Monthly collision estimates for gannet calculated using monthly, seasonal and annual proportions for birds in flight (based on Burbo Bank Offshore Wind Farm data as an example).

D.4 Conclusion

D.4.1.1.1 Comparisons of annual, seasonal and monthly proportions of birds in flight for kittiwake showed good correspondence in some months and between seasons. Any variation that was present was considered to have a limited impact on resulting collision risk estimates.

D.4.1.1.2 A similar conclusion in relation to variation between datasets was reached for gannet, although in some months and seasons the number of birds recorded across the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets was considered too low to enable the calculation of representative proportions. Any variation that was present was also considered to have a limited impact on resulting collision risk estimates.

D.4.1.1.3 The sample sizes for lesser black-backed gull were considered too low to allow the calculation of representative proportions on monthly and seasonal bases. The use of an annual proportion was therefore considered to be the only viable option for this species.

D.4.1.1.4 However, for lesser black-backed gull it should be noted that the use of monthly, seasonal or annual proportions would make no material difference to collision risk estimates. Calculation of collision risk estimates for lesser black-backed gull was only required for one project (Robin Rigg offshore wind farm) in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note. This exercise applied an annual proportion of birds in flight of over 60%. Applying this proportion provided a limited number of collisions and therefore it is considered that, even if it was assumed that 100% of lesser black-backed gulls were in flight across all months, this would not alter the conclusions reached in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note.

D.4.1.1.5 The sample sizes for herring gull were considered too low in all months to allow for the calculation of representative proportions on a monthly basis. Sample sizes were higher on a seasonal basis, with the seasonal proportions showing limited variation and therefore good correspondence with the annual average proportion. The use of an annual proportion is therefore considered valid for herring gull.

D.4.1.1.6 In conclusion, it has been demonstrating that the use of annual proportions of birds in flight calculated from data associated with the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets is appropriate for all four species in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects note.

D.5 References

Cook, A.S.C.P., Ward, R.M., Hansen, W.S. and Larsen, L. (2018) Estimating Seabird Flight Height using LiDAR. Scottish Marine and Freshwater Science Vol 9 No 14.

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, N.H.K. (2014) Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology, 51, 31-41.

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Waggitt, J.J., Evans, P.G., Andrade, J., Banks, A.N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C.J., Durinck, J. and Felce, T. (2020) Distribution maps of cetacean and seabird populations in the North-East Atlantic. Journal of Applied Ecology, 57(2), pp.253-269.

Appendix E: Minutes of Mona and Morgan Offshore Ornithology SNCB Meeting

MINUTES OF MEETING

Security Classification: Project External

Partners in UK offshore wind

MOM Number	:	20240829_Morgan and Mona Offshore Ornithology	**REV. No.**	:	F01
MOM Subject	:	Morgan and Mona Offshore Wind Projects & SNCB meeting: Offshore Ornithology CEA - Gap-filling of historical offshore wind projects			

MINUTES OF MEETING

MEETING DATE	:	29/08/2024
MEETING LOCATION	:	MS Teams
RECORDED BY	:	[redacted] (RPS)
ISSUED BY	:	[redacted] (RPS)

PERSONS PRESENT:

- [redacted] – bp (SR)
- [redacted] – bp (PC)
- [redacted] – bp (HA)
- [redacted] – bp (PB)
- [redacted] – RPS (KL)
- [redacted] – RPS (ST)
- [redacted] – RPS (TGB)
- [redacted] – RPS (LM)
- [redacted] – RPS (NG)
- [redacted] – NIRAS (MH)
- [redacted] – NIRAS (AM)
- [redacted] – JNCC (RS)
- [redacted] – JNCC (MM)
- [redacted] – JNCC (RH)
- [redacted] – NRW (EL)
- [redacted] NRW - (PM)
- [redacted] – NRW (AC)
- [redacted] – NRW (HR)
- [redacted] – NRW (EC)
- [redacted] – Natural England (KB)
- [redacted] – Natural England (RB)

ITEM NO:	DISCUSSION ITEM:	Responsible party	Date
1.	**Project Updates** KL welcomed all to the meeting and led introductions. HA provided an update on the Mona Offshore Wind Project. HA – The Mona Offshore Wind Project Examination is ongoing. Deadline 2 was on 27th August. The Examining Authority (ExA) issued a Rule 17 letter specifically referring to offshore ornithology, a response to which was provided at Deadline 2 and will be live on the Planning Inspectorate website soon. Also included at Deadline 2 were revised	**Mona Offshore Wind Project Deadline 2**	27/09/24

	offshore ornithology application documents to address identified errata and revised Cumulative Effects Assessment (CEA) numbers to align with the Morgan Offshore Wind Project: Generation Assets (hereafter referred to as the Morgan Generation Assets) and Morecambe Generation Assets, responses to Written Representations were also submitted. Deadline 3 is on 30th September and the Applicant is anticipating submitting the results of the gap-filling analysis then. KL- This draft technical note sent to the Statutory Nature Conservation Bodies (SNCBs) ahead of the meeting will be updated to reflect the updated application material submitted at Deadline 2 and SNCB feedback where appropriate (including the Written Representations). The results presented in the final technical note will not materially differ from those presented in the draft technical note. MM - We may disagree that the edits made to the application material would not make a difference to the results of the gap-filling analysis. KL- Noted, it may make some difference to the overall numbers but it won't change the numbers produced for the historical projects or the overall conclusions of the assessments. SR provided an update on the Morgan Generation Assets. SR – The Procedural Deadline for the Morgan Generation Assets was on 27th August, the Rule 6 Letter setting out the Morgan Generation Assets timescales was issued on 5th August. The first hearings are being held on 10th September and Deadline 1 is on 3rd October. Statement of Common Ground (SoCG) meetings are ongoing in preparation for submission at Deadline 1.	**Mona Offshore Wind Project Deadline 3** **Morgan Generation Assets Deadline 1**	30/09/24 3/10/24
2.	**Context for gap-fill methodology** KL set out the context for the gap-filling methodology and the advice received up to this point from SNCBs. KL – The SNCB responses to the Mona Offshore Wind Project s42 consultation flagged concerns in relation to the consideration of historic offshore wind projects. In October 2023, advice from Natural England which was endorsed by Natural Resources Wales (NRW) and the Joint Nature Conservation Committee (JNCC) was issued to the Mona Offshore Wind Project and Morgan Generation Assets (hereafter referred to as the 'SNCB Advice Note') regarding suggested methodologies for 'gap filling' historical offshore wind projects. For the Mona Offshore Wind Project and Morgan Generation Assets applications, the Applicants provided a qualitative assessment of certain historical offshore wind projects' impacts on offshore ornithology. In Relevant Representations (Mona Offshore Wind Project and Morgan Generation Assets) and Written Representations (Mona Offshore Wind Project only), it was flagged that a qualitative assessment for these historical offshore wind projects may be insufficient. The aim of the gap-fill work was to generate indicative numbers for currently unquantified impacts from historical projects using a methodology recommended in the SNCB Advice Note, to provide an understanding of potential cumulative or in-combination impacts and to enable an informed judgement to be made on the risks associated with these projects.		

	KL- The Applicants and the SNCBs have previously discussed the difficulty of reassessing other projects' impacts. In addition, the Applicants and SNCBs have discussed that this is something that typically hasn't been done for other offshore wind projects and ought to be addressed at a strategic level. However, the Applicants are looking to support the SNCBs and provide the information to allow advice on significant effects and adverse effects on integrity (AEoI) to be provided with respect to the Mona Offshore Wind Project and Morgan Generation Assets. The gap-fill analysis results should be viewed alongside the Environmental Impact Assessments (EIA) and Habitats Regulation Assessments (HRA) submitted with the applications. KL- The Applicants have followed the SNCB Advice Note for the gap-fill analysis. There are a number of ways that these estimates could be generated. The Mona Offshore Wind Project and Morgan Generation Assets ornithology teams (RPS and Niras) have worked together on the approach liaising with the Morecambe Generation Assets project team and ornithologists (Royal HaskoningDHV). The specialists feel that the approach adopted is the most defensible and robust approach. LM – The Applicant has considered all three potential approaches from the SNCB Advice Note. With regards to the first, where possible, site-specific abundance data for historical projects from submitted Environmental Statements were used in the application documents. Post-application the Applicant has identified more information from historical projects before undertaking the third approach. The Applicant has progressed with the third approach for quantifying the impacts of historical projects, using data on seabird distributions from the Marine Ecosystems Research Programme (MERP). This is regarded in the SNCB Advice Note as a 'more rigorous assessment' to gap-fill historical projects.		
3.	**<u>Gap filling methodology for Mona Offshore Wind Project and Morgan Generation Assets (presented by LM)</u>** Displacement – To gap-fill historical projects, the Applicant used data on seabird distribution from the MERP (Waggitt *et al*., 2020) as specified by the SNCB Advice Note from October 2023. For four of the eight historical projects, MERP data was used. For the rest, a combination of MERP data and site-specific data identified post-application was used. The data used was presented in table 1.2 of the results note issued ahead of this meeting. Collision Risk Modelling (CRM) – If collision risk data from project-specific documentation were not available for a given historical project, the Applicant obtained data on seabird densities from MERP. Seabird Mapping and Sensitivity Tool (SeaMaST) data was used to quantify the density of great black-backed gull. Collision risk modelling was undertaken using the stochastic CRM (sCRM) developed by Marine Scotland (McGregor et al., 2018). Collision risk models were run deterministically in the sCRM using Band Option 2 of the sCRM. Displacement and mortality- The parameters used were identical to the parameters used in the respective Mona Offshore Wind Project and Morgan Generation Assets development consent order (DCO) applications. Both the species-group and species-specific avoidance		

	rates have been used, both of which come from Ozsanlev-Harris *et al.* (2023). The full range of displacement and mortality rates has been presented but the Applicant's preferred displacement and mortality rates were taken forward to compare the CEA at application and the CEA gap-fill. RH – After the Atlantic Puffin mortality numbers were corrected in the revised Mona Offshore Wind Project Application documents updated at Deadline 2, were they included in the gap-fill work? LM – Not as it stands (see post-meeting note on page 4). HR – What were the reasons for running the model deterministically rather than stochastically? NG – Waggitt/Bradley data presented as mean abundance and with standard deviations but the way that the parameters were used for the wind turbines meant that the Applicant couldn't use both. HR – Suggest this detail is included in the technical note as it is currently not in the draft version. NG – This will be clearly explained within the results note submitted at Deadline 3. **Post-meeting note:** The corrected annual impact on Atlantic puffin from displacement was 0 (0 to 3) birds (30% displacement to 1% mortality to 70% displacement to 10% mortality) - as amended in updated Volume 2, Chapter 5: Offshore ornithology (REP2-016). Considering the maximum impact on Atlantic puffin is 3 birds annually, and that the abundance of birds from project-specific applications in the Irish Sea is low, it was not deemed necessary to gap-fill projects for Atlantic Puffin.	**The Applicants to clearly explain why the model was run deterministically rather than stochastically in the results notes submitted at Deadline 3 for the Mona Offshore Wind Project and Deadline 1 for the Morgan Generation Assets.**	30/09/2024 (Mona) 03/10/2024 (Morgan Generation Assets)
4.	**<u>Mona Offshore Wind Project Results (presented by LM)</u>** For displacement of kittiwake, the difference in baseline mortality between the CEA presented within the DCO application and the CEA gap-fill results is very small (<0.017%). This is the same across all species, meaning that the addition of the quantitative data for historical projects added little in terms mortality. For collision, the difference in the increase in baseline mortalities are again small (e.g. 0.045% for the consented and as-built parameters for back-legged kittiwake). Based on the small differences in baseline mortalities, the additional historical projects will have no effect on the conclusions of the CEA presented at application and would not affect the overall conclusions of no AEoI on any Special Protection Areas (SPAs) designated for black-legged kittiwake. Due to the change in mortality between the CEA presented in the Mona Offshore Wind Project application documents and the gap-filled CEA, there is the need to undertake further assessment (PVA) of the impact to see if the magnitude of impact presented within Volume 2, Chapter 5: Offshore ornithology is still valid. For greater black-backed gull, the gap-fill CEA for collision results in an increase of baseline mortality of 3.450 % (using the species-group avoidance rate recommend by SNCBs) and therefore there is a need to conduct an updated Population Viability Analysis (PVA) for this species. Further		

	assessment (PVA) on great black-backed gull is presented in the draft technical note issued before this meeting and in slide 24. The Applicants consider that connectivity between the Mona Offshore Wind Project and the Isles of Scilly SPA is highly unlikely, and that a PVA is therefore unnecessary for the Mona Offshore Wind Project, but a PVA has still been conducted to demonstrate the potential impact on the population. For herring gull, the difference in the increase in baseline mortality are small (0.333%). Based on the small differences in baseline mortalities, the additional historical projects will have no effect on the conclusions of the CEA presented at application and would not affect the overall conclusions of no AEOI on any SPAs designated for herring gull. For lesser black-backed gull, the difference in the increase in baseline mortality are small (0.025%). Based on the small differences in baseline mortalities, the additional historical projects will have no effect on the conclusions of the CEA presented at application and would not affect the overall conclusions of no AEOI on any SPAs designated for lesser black-backed gull. For northern gannet, the difference in the increase in baseline mortality are small (0.015%). Based on the small differences in baseline mortalities, the additional historical projects will have no effect on the conclusions of the CEA presented at application and would not affect the overall conclusions of no AEOI on any SPAs designated for northern gannet. For kittiwake and northern gannet combined displacement and collision risk, the increases in baseline mortality are small (0.011% and 0.003% respectively). Based on the small differences in baseline mortalities, the additional historical projects will have no effect on the conclusions of the CEA presented at application and would not affect the overall conclusions of no AEOI on any SPAs designated for northern gannet and kittiwake. <u>PVA for great black-backed gull (presented by NG)</u> The cumulative impact on great black-backed gull continues to surpass the 1% threshold for further assessment. When considering the cumulative increase in baseline mortality, it is predicted to be 3.450% (when using the species-group avoidance rate of 99.39) and 0.517% (when using the species-specific avoidance rate of 99.91). The counterfactual growth rate is 0.996; this is smaller than the baseline (unimpacted) scenario. All three modelled scenarios result in population growth. RB – The largest Biologically Defined Minimum Population Scales (BDMPS) population being used in the PVA is still the 44,753. In March 2024 advice was provided with a different population (largest was 17,742). Confused as to why the 44,000 population is still being used, as the 17,742 would give different results. The reference population used for the Morgan Generation Assets is the correct 17,742. HR worked on this and can provided further information. HR – The initial 44,000 advised in 2023 was joint SNCB (NE/NRW/JNCC) advice, where all UK non-SPA western colonies from Furness (2015) had been included in the total UK south-west and Channel BDMPS (that relevant for Mona/Morgan) breeding season reference population calculation. This was subsequently revisited by		

	NE and NRW and a review of the locations of great black-backed gull non-SPA western colonies showed that a significant proportion of these were located in Scotland. A review of the colonies and their counts from Seabird 2000 was undertaken and based on the locations of the colonies with regard to the relevant BDMPSs, the total non-SPA western colonies total from Furness (2015) was split out accordingly to the UK south-west and Channel BDMPS and the UK west of Scotland waters BDMPS. This resulted in a recalculated south-west and Channel BDMPS breeding season reference population of 13,424, meaning that the largest BDMPS to use for EIA annual impact assessment was the non-breeding season figure of 17,742 from Furness (2015). The 17,742 therefore became the correct reference population and was included in the interim Natural England and NRW advice note sent by Natural England to Round 4 and Extension projects in March 2024 (see post-meeting note on page 7). RB – It might be worth checking through in general to make sure that the numbers provided in this Advice Note are reflected in both the Mona Offshore Wind Project and Morgan Generation Assets assessments – Morgan Generation Assets has used a herring gull number that may also not be correct. NG – The PVA results for the gap-fill exercise could be re-run using this BDMPS number if necessary.	**The Applicants to check that the numbers provided in the SNCB Advice Note in March 2024 are reflected in both the Mona Offshore Wind Project and Morgan Generation gap-fill.**	30/09/2024 (Mona) 03/10/2024 (Morgan Generation Assets)
	RH – In terms of the use of percentage of birds in flights from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets surveys and applying these to the gap-filled projects, we would query how appropriate it would be to apply those numbers to wind farms closer to the coast, given that birds may behave differently closer to the coast than further offshore? It would be worth checking the percentages of birds in flight from wind farms located closer inshore with available data. NG – These numbers were chosen as those are the most recent surveys and were conducted across the widest swathe of the Irish Sea. It may be possible to incorporate Awel y Mor's aerial survey data as a representative closer to the coast. HR – The percentage of birds in flight is averaged from an annual number to produce an identical % for each month – is this appropriate, given CRM uses monthly density estimates of birds in flight? NG – It would be possible to do a month-by-month breakdown – we can review and see if this produces differences in the results if used. HR – Would definitely like to see the results using a month-by-month number for percentage of birds in flight. *Post meeting note: The Applicants are not able to include the monthly breakdown of birds in flight for the Mona Offshore Wind Project in the submission for Deadline 3. This analysis will be included in the submission for the Morgan Generation Assets and the results are expected to be identical between projects as the same data has been used. The Applicants will further engage with the SNCBs regarding the monthly breakdown of birds in flight for the Mona Offshore Wind Project and will submit the analysis into examination at Deadline 4.* MM – There's also the possibility to use the in-flight data from the MERP data.	**The Applicants to run a month-by-month breakdown of the percentage of birds in fight to check if results differ** **The Applicants to check whether there are any significant differences between the percentage of birds in flight numbers from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets surveys and those**	30/09/2024 (Mona) 03/10/2024 (Morgan Generation Assets) 30/09/2024 (Mona) 03/10/2024 (Morgan Generation Assets)

	NG – This was looked at but wasn't available in the timeframes. RB – If you run the CRM deterministically it shouldn't matter whether monthly numbers are adjusted front-end or back-end. Main concern with data is that again this data is predominantly offshore, whereas the historical projects are closer to shore, and there are behavioural differences closer to shore. If you can justify that this approach is appropriate and that there's no difference whichever percentage of birds in flight is used then that would be good and Natural England would be content with what has been produced, but currently this is an area of uncertainty. Might be useful to look at if any of the historical projects have Digital Areal Survey data available. KL – We can look into this to see if there are any significant differences between the percentage of birds in flight numbers from the Mona Offshore Wind Project, Morgan Generation Assets and Morecambe Generation Assets surveys and those available from historical projects. RB – Appreciated and agree that the idea here was always to produce indicative numbers and that this is, overall, a procedure designed to produce estimates. **Post-meeting note:** The Mona Offshore Wind Project did not directly receive the Natural England and NRW advice note from Natural England but instead was made aware of it through Morgan Offshore Wind Ltd.	**available from historical projects.**	
5.	**<u>Morgan Generation Assets Results (presented by MH)</u>** <u>Displacement</u> Similarly to the Mona Offshore Wind Project, for all species for displacement including historical projects does not materially alter the predicted magnitude of impact. In addition, these conclusions are also applicable to the ISAA, so no AEOI for all SPAs. <u>Collision risk</u> For kittiwake, the percentage increase in baseline mortality is small, and the conclusions presented at application do not change (no AEOI). For great black-backed gull, the percentage of baseline mortality does increase when incorporating historical projects but doesn't cross any thresholds to trigger the requirement for further assessment. For herring gull and lesser black-backed gull, the percentage increase in baseline mortality is small (although larger than kittiwake), and the conclusions presented at application do not change (no AEOI). For lesser black-backed gull, a lot of historical projects had already run assessments so a very small percentage increase is observed. For gannet, the increase in baseline mortality is small, and the conclusions presented at application do not change (no AEOI). For kittiwake and northern gannet combined displacement and collision risk, the increases in baseline mortality are small, and the conclusions presented at application do not change (no AEOI). KL – There is a technical note presenting initial results from the gap-fill exercise being prepared for the Morgan Generation Assets (planned		

	to be submitted at Deadline 1) which will be circulated after this meeting. Do the SNCBs have any more feedback on the approach – is what has been presented in line with what was required (noting clarifications required above)? RB – Agree that broadly the approach provides the information requested by SNCBs, but clarification is required on a few points. The results suggest that some of the historic projects do contribute to the cumulative effect so SNCBs maintain their position that this quantification was necessary. HR – The use of the MERP data is certainly more repeatable and defensible than the proxy approach but as per earlier, note the clarification on the points raised regarding birds in flight and try to source data closer to shore than the Mona Offshore Wind Project and Morgan Generation Assets data. RH – We are happy with the general approach and the use of MERP makes sense. Can any extra information used in these updated assessments/models be provided (e.g. wind farm width) so that the CRM outputs can be replicated? We're happy to provide written feedback on the technical note when provided. MH – Wind farm width not used for these models but happy to send over everything we've used in the Morgan Generation Assets modelling in the gap-fill technical note or include it in an appendix to the note. RB – In the initial advice from SNCBs a collaborative approach was recommended. This was to reduce the workload on individual projects but also to ensure consistency. From our perspective, it is important that the updated assessments all use the same data. It was clear that there was collaboration on the initial (critical/negative) response to SNCB advice, **but** since then, projects appear to have pursued their own gap-filling exercises using different methods. White Cross used the proxy sites method, generating indicative assessments of historic projects while also highlighting the relative levels of uncertainty & generally placing little confidence in the results. We considered the outputs sufficient to agree with the project's conclusions, noting that for some historic projects relatively high levels of impact were calculated for some species. However, Natural England are **not** advising that other projects adopt those impact estimates for CEA. SNCBs are currently unsure what approach Morecambe Generation Assets are taking to gap filling. Is there any collaboration ongoing between Morgan Generation Assets, the Mona Offshore Wind Project and the Morecambe Generation Assets? SR – Yes, the advice regarding alignment is being taken on board by all projects and there is a lot of conversations taking place between the projects while the Morecambe Generation Assets consider their Relevant Representations. HR – Note that Llyr wind farm project application has recently been submitted, and their figures are now in the public domain. KL – Noted the submission of the Llyr wind farm project application. Before we move to Next Steps, it is worth noting that other projects have approached the same problem of the historic project data gaps	**The Applicants to provide all parameters used in the Mona Offshore Wind Project and the Morgan Generation Assets modelling in the gap-fill analysis.**	30/09/2024 (Mona) 03/10/2024 (Morgan Generation Assets)

	in different ways. For example, White Cross has taken a "proxy wind farm" approach and we note that SNCBs did not want that exercise repeated for the Mona Offshore Wind Project and the Morgan Generation Assets. The Morecambe Generation Assets' DCO application took the approach of looking at how much the historic projects would need to add to the cumulative effects to exceed certain thresholds (and therefore represent a risk to protected bird species) and concluded they are unlikely to add to the risk of significant effects/AEoI. Ultimately, there is no significant difference in their conclusions with the inclusion of quantified impacts from historic projects. Given that the Mona Offshore Wind Project and the Morgan Generation Assets have undertaken different analyses, this suggests that no matter how this issue of data gaps from historic projects is viewed, these projects do not represent an increased risk for the Mona Offshore Wind Project and the Morgan Generation Assets. Do the SNCBs agree with this broad view (noting clarifications the Applicants need to provide) and that this issue will not likely lead to AEoI or significant effects on bird populations? KL noted these are well sited projects and the risks to birds from these is low. RB – Agree that the risk of adverse effects from these projects is low and they are well sited, and that the White Cross proxy advice was not advised for the Mona Offshore Wind Project and the Morgan Generation Assets. The numbers presented indicate that SNCBs were right to ask for quantification of the impacts, as for some projects the impacts predicted were "negligible" and this exercise showed there is some impact. Whilst it is acknowledged that the risk of adverse effects is low, SNCBs need to clarify these points to ensure confidence in the conclusions. MM – Agree with RB. Clarification is needed to rule out adverse effects, but agree risk is low. HR – Agree with above. In general, NRW feel the risk of adverse effects is low but need clarity on a few points to ensure it can be ruled out beyond reasonable scientific doubt.		
6.	**<u>Next Steps (presented by ST)</u>** <u>The Mona Offshore Wind Project</u> • The results presented in the draft Technical Note reproduce the relevant results presented in the corresponding tables of the Offshore Ornithology chapter submitted in the application. • Revised offshore ornithology application material has been submitted at Deadline 2 • Given that the draft technical note was not issued to SNCBs ahead of Deadline 2, it was considered appropriate to retain the use of the total abundances presented in the application, which have already been seen by the SNCBs, rather than introduce new, unseen material in addition to the information on the gap filled historical projects. Therefore, no amendments were undertaken to account for	**Morgan Generation Assets Draft Technical Note to be distributed to SNCBs.** **The Mona Technical Note will be submitted at Mona Offshore Wind**	Complete 30/09/2024 (Mona)

	errata or Written Representations for the purpose of the draft results sent before the meeting. • The draft Technical Note will be updated and submitted at Deadline 3 to take account of the updated application material submitted at Deadline 2. • The results presented in the final technical note will not materially differ from those presented in the draft technical note. • If you could provide key feedback on the draft Technical Note within 1 week from this meeting it would be much appreciated. This would allow the Applicant to incorporate and address the feedback in the note to be submitted at deadline 3. • The Applicant notes that detailed formal feedback would be received through the examination process. <u>Morgan Generation Assets</u> • The draft Technical Note and methodology paper will be submitted into the Examination at Deadline 1 • If you could provide comments on the Morgan Generation results as presented on the slides circulated within 2 weeks from this meeting it would be much appreciated. • The Applicant notes that detailed formal feedback would be received through the examination process. <u>General</u> • Minutes will be circulated two weeks after the meeting. SNCBs to review and return one week from that date.	**Project Deadline 3 and Morgan Generation Assets at Deadline 1.** **SNCBs to provide key feedback within 1 week for the Mona Offshore Wind Project.** **SNCBs to provide key feedback within 2 weeks for Morgan Generation Assets.** **Minutes to be circulated within 2 weeks of the meeting. SNCBs to review and return 1 week from that date.**	03/10/2024 (Morgan Generation Assets) Complete Complete Complete