Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Kittiwake apportioning clarification note

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Image of an offshore wind farm

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Glossary

Term	Meaning
Applicant	Morgan Offshore Wind Limited.
Apportioning	A method that assigns unknown entities to known entities based on weighing factors. In this report, it refers to birds of unknown origin within the study area that are assigned to colonies based on distance to colony and colony size.
Biologically Defined Minimum Population Scale	Minimum regional population size of a particular bird species at a certain time of year, defined for a range of species in Furness (2015).
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).
Ornithology	Ornithology is a branch of zoology that relates to the study of birds.
Special Protection Area	A designation under the European Union Directive on the Conservation of Wild Birds, under which countries have a duty to safeguard the habitats of migratory birds and certain particularly threatened birds.
The Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.

Acronyms

Acronym	Description
AEOI	Adverse Effect on Integrity
DAS	Digital Aerial Survey
EWG	Expert Working Group
ExA	Examining Authority
HRA	Habitats Regulations Assessment
LSE	Likely Significant Effect
NRW	Natural Resources Wales
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Areas

Units

Unit	Description
%	Percentage

1 KITTIWAKE APPORTIONING

1.1 Introduction

1.1.1.1 This document has been prepared in response to Relevant Representations received from Natural England (RR-026) and Relevant Representations and Written Representations received from Natural Resources Wales (RR-027 and REP1-056). These representations focussed on the methodology used to calculate adult proportions for use as part of the apportioning approach for kittiwake, in order to inform apportioning analyses used as part of the assessments conducted in the Habitats Regulations Assessment (HRA) Stage 1 Screening Report (APP-099) and HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

1.1.1.2 In Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057) the Applicant applied an approach that sought to address the known over-estimate inherent in the apportioning process for kittiwake, namely the inability of site-specific survey data to provide a representative estimate of immature kittiwake. This approach was developed during the Examination for the Hornsea Project Two Offshore Wind Farm (SMart Wind, 2015), and has subsequently been applied in other offshore wind farm assessments which have been consented (Ørsted, 2018; The Crown Estate, 2022; The Crown Estate, 2024). This approach makes use of age-specific survival rates from Horswill and Robinson (2015) in order to calculate the proportion of different age classes likely to be present in a given sea area.

1.1.1.3 This report therefore considers the implications for the assessments conducted in HRA Stage 1 Screening Report (APP-099) and HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) if the approach to calculating the proportion of immature birds applied in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057) is removed in line with requests from Natural England and NRW.

1.1.2 Background

1.1.2.1 Although any population of breeding seabirds has an immature component associated with it, the spatial distribution of that component is often very different to the breeding adult component, especially in the breeding season. For many seabird species, immature birds gradually begin to return to natal waters in the breeding season with an increasing affinity as they get nearer to breeding age. The proportion of older immature age classes in natal waters is therefore higher than the proportion of younger immature age classes (Coulson, 2011). In addition, the distribution of immature birds in natal waters may be dictated by proximity to breeding colonies, either because birds are prospecting for breeding sites or due to competition with breeding adult birds. Where all immature classes of a species can be reliably identified during baseline surveys this is less of an issue. However, for species for which only some age classes can be identified during baseline surveys, resulting immature proportions represent an under-estimate.

1.1.2.2 In the context of this report, this overestimate of the proportion of breeding adults is relevant to kittiwake. Whilst one year old kittiwakes can be easily identified during site-specific surveys due to differences in plumage, second and third year old birds, which have not yet reached the age of first breeding, cannot (Coulson, 2011; Olsen and Larsson, 2003). Therefore, data on age class collected during surveys will potentially represent a considerable overestimate of the proportion of breeding adults present in

a given sea area. Based on calculations in Furness (2015), for every adult kittiwake there are 0.88 immature birds when assuming a stable population. Applying this ratio to a population in a given sea area during the breeding season is not necessarily accurate as breeding adult birds and immature birds have differing distributions during this period and therefore it can be expected that differing proportions of each cohort may be present. As discussed above, immature birds are present in UK waters throughout the breeding season and, with immatures representing nearly 50% of the population, it is clear that excluding older immature birds from any apportioning approach will lead to an over-estimate. For the Morgan Generation Assets it is considered that this would be in the order of approximately 30% at a minimum with this proportion differing depending on factors such as proximity to breeding colonies.

1.1.2.3 An approach was applied in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057) that aimed to address the underestimation. Whilst maintaining the proportion represented of each year class of immatures at the Morgan Generation Assets, mortality reduces the absolute number of birds present from each successive year class of kittiwake. In calculating the number of two and three year old kittiwakes at the Morgan Generation Assets, the analysis uses survival rates of each immature age class of kittiwake that follows the rate provided in Horswill and Robinson (2015).

1.1.2.4 Natural England and NRW have queried the suitability of the first year survival rate for kittiwake presented in Horswill and Robinson (2015) for use in this apportioning approach. It is important to note that the first year survival rate from Horswill and Robinson (2015) is also used for the following aspects of ornithological impact assessments for offshore wind farms which are recommended by Natural England and NRW:

- PVA modelling: The first year survival rate from Horswill and Robinson is included as the default value for all available survival rate data options in the Natural England PVA tool. All PVA models produced to inform the assessments for offshore wind farms would therefore utilise this value.
- Calculation of apportioning values for the non-breeding season: The calculation of apportioning values for the non-breeding season utilises population data from Furness (2015). The population data calculated in Furness (2015) provides immature populations which are calculated through the application of the first year survival rate from Horswill and Robinson (2015). The calculation of apportioning values for the non-breeding season, which are used in all offshore wind farm applications, is therefore underpinned by this survival rate value.
- Average baseline mortality rates: The assessments in Volume 2, Chapter 5: Offshore ornithology (APP-023) utilise an average baseline mortality rate calculated using survival rates for all age classes as recommended by Natural England and NRW. For kittiwake, the first year survival rate from Horswill and Robinson (2015) is used to inform this calculation.

1.1.2.5 It is certain that an unknown proportion of the cohort of unaged ‘adult type’ kittiwakes at the Morgan Generation Assets will include two and three year old birds. Coulson (2011) provides evidence that shows that immature kittiwake visit natal waters, with increasing numbers of older immatures visiting breeding colonies. This therefore supports the conclusion that the approach proposed by Natural England and Natural Resources Wales (as set out in Table 1.1) to calculate an apportioning value for the breeding season will under-estimate the proportion of second and third year immatures which will show a much greater affinity for natal waters than first year birds.

1.1.2.6 The approach applied in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057) is therefore considered precautionary as a smaller proportion of one year old birds are likely to be present in natal waters with a much greater proportion of older age classes of immature birds showing affinity with natal waters and therefore the proportions of older age classes is likely underestimated when applying the approach.

1.1.2.7 In the breeding season, connectivity has not been identified between the Morgan Generation Assets and any English SPAs, with connectivity identified with only one Welsh SPA (Skomer, Skokholm and Seas off Pembrokeshire SPA/Sgomer, Sgogwm a Moroedd Penfro SPA) in Welsh waters. The majority of SPAs for which connectivity has been identified in the breeding season are located in Northern Ireland and the Republic of Ireland with one further site in Scotland (Ailsa Craig SPA). This issue highlighted by Natural England and NRW is therefore not applicable in English waters.

Table 1.1: Representations received from relevant consultees.

Reference	Consultee	Consultation stage	Comment	Response
RR-026.B.68	**Natural England**	**Relevant Representation (RR-026)**	Table 1 Summary of Key Issues – Offshore Ornithology Identified Impacts B27 [APP-057] 1.3.4.11, 1.2.3.14, Table 1.5 The Applicant has followed a method developed by Hornsea Project Two to undertake kittiwake age apportioning. Natural England reiterate the SNCB advice provided to the EWG, that we do not agree with the use of this method. The method uses survival rates and the proportion of birds aged as one year old in the baseline survey data to calculate the proportions of adult birds that are actually second or third year (assumed non-breeding) birds. Natural England consider this method problematic. •It is not clear if the proportion of birds aged as one-year old is representative of the 'juvenile birds' present. These birds can be aged as such (due to distinctive plumage features) on initial fledging and into their 'first summer' the following year (when they are in fact, second year birds). Those cohorts are subject to different survival rates. • The juvenile survival rates (0-1 year) given in Horswill & Robinson (2015) are extremely dated and from a single North Sea colony (Coulson & White, 1959). It is highly uncertain that they are applicable here. Natural England's Recommendations to Resolve Issues. Natural England advise a more appropriate approach for age-apportioning kittiwakes in the breeding season would be to simply use the 84.11% of adults recorded in the Morgan site-specific DAS data. Alternatively, given the general uncertainty around the value of ageing data for kittiwakes we advise the Applicant should take a precautionary approach and assume all birds present in the breeding season are adults for the purposes of impact assessment.	The methodology used for Hornsea Two has been applied incorporating site-specific data from the Morgan Generation Assets. This approach was developed as part of the Hornsea Two assessments in consultation with Natural England and applied as part of the assessments presented for that project by both the Applicant and Natural England. As discussed in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057), the approach applied is ecologically valid whilst remaining precautionary and is still highly likely to return an immature proportion that is an under-estimate (and therefore over-estimate the adult proportion). The alternative approach advised by the SNCBs that assumes 100% of the kittiwake present at the Morgan Generation Assets are adults does not represent a precautionary approach, rather it represents an ecologically invalid approach that does not use the best available evidence as it is well documented that immature kittiwake visit natal waters during the breeding season (e.g. Coulson, 2011) and will therefore be present at the Morgan Generation Assets. Therefore, based on survival rates, it was estimated that the 84.11% of kittiwakes recorded as adults in the Morgan Generation Assets site-specific DAS data actually comprised 13.57% two year old birds, 11.59% three year old birds and 58.95% adults.
RR-027.27	**Natural Resources Wales**	**Relevant Representation (RR-027)**	Age class apportionment for seabirds (Volume 4, Annex 5.5, APP-057)	The methodology used for Hornsea Two has been applied, incorporating site-specific data from the Morgan Generation Assets. This approach was

Reference	Consultee	Consultation stage	Comment	Response
			21. We do not consider the use of the kittiwake adult proportion that was calculated for Hornsea 2 to be appropriate to apply to Morgan as the juvenile survival rates (0-1 year) given in Horswill & Robinson (2015) are very old and from a single colony in the North Sea (taken from Coulson & White 1959) and hence have a poor data quality score (score of 1). Hence there is uncertainty around the appropriateness of the approach. Therefore, we advise a more appropriate approach for the breeding season would be to use the proportion (84.11%) of adults recorded in the Morgan site-specific Digital Aerial Survey (DAS) data, or to take the precautionary approach and assume all birds are adults.	developed as part of the Hornsea Two assessments in consultation with Natural England and applied as part of the assessments presented for that project. As discussed in Volume 4, Annex 5.5 Offshore ornithology apportioning technical report (APP-057), the approach applied is ecologically valid, whilst remaining precautionary and is still highly likely to return an under-estimated immature proportion (that therefore over-estimate the adult proportion). To assume that 100% of the kittiwake present at the Morgan Generation Assets are adults does not represent a precautionary approach, rather it represents an ecologically invalid approach that does not use the best available evidence as it is well documented that immature kittiwake visit natal waters during the breeding season (e.g. Coulson, 2011) and will therefore be present at the Morgan Generation Assets. The use of 84.11% would represent a known over-estimate, as it is known that the older immature kittiwake, whose plumage is inseparable from that of breeding adults, visit natal waters during the breeding season (e.g. Coulson, 2011). The percentage of adults calculated by the Applicant (58.95%) takes into account all immature age classes whilst remaining precautionary, and has therefore been applied in the assessments.
REP1-056.28 and REP1-056.29	**Natural Resources Wales**	**Written Representation (REP1-056)**	Apportionment of impacts (age classes, methods for apportionment of impacts to designated sites) Age class apportionment: kittiwake in the breeding season (Applicant response reference to RR-027.27 in PD1-017). In our Relevant Representations [RR-027], NRW (A) raised concerns regarding the appropriateness of the Applicant's use of the kittiwake adult proportion that was calculated for Hornsea 2. We note that this approach was not raised by the Applicant during EWG meetings or subsequently, and therefore NRW (A) has not agreed to this approach. In their response to this issue in PD1-017, the Applicant states that 'this approach was developed as part of the	As discussed in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057), the approach applied is ecologically valid whilst remaining precautionary, and is still highly likely to return an immature proportion that is an under-estimate (and therefore over-estimate the adult proportion). The use of 84.11% would represent a known over-estimate, as it is known that older immature kittiwake age classes, whose plumage is inseparable from that of breeding adults, visit natal waters during the breeding season (e.g. Coulson, 2011). Coulson

Reference	Consultee	Consultation stage	Comment	Response
			Hornsea Two assessments in consultation with Natural England and applied as part of the assessments presented for that project'. Whilst it may be the case that the Hornsea 2 approach was developed in consultation with NE, it does not necessarily mean NRW agree with the approach or that it is applicable to a different project located in a different area. We note that the Hornsea 2 approach to apportioning to age class referred to in Paragraph 1.2.3.13 of the Applicant's Apportioning Technical Annex [APP-057] relies on reliable counts of first year birds, i.e. in the case of kittiwake first summer birds which by August of that year have largely transitioned to adult plumage and are indistinguishable from mature adults. Therefore, the identification rate of first summer kittiwake is questionable and calculations derived from this e.g. applying survival rates to define an age class structure, are also questionable. Additionally, the juvenile survival rates (0-1 year) given in Horswill & Robinson (2015) are very old and from a single colony in the North Sea (taken from Coulson & White 1959) and hence have a poor data quality score (score of 1) and therefore it is highly uncertain that they are applicable here. These issues mean there is uncertainty around the appropriateness of the approach for use at the Morgan Generation Assets site which is located in the Irish Sea. Therefore, we reiterate our advice from our Relevant Representations [RR-027] that a more appropriate approach for the breeding season would be to use the 84.11% of adults recorded in the Morgan Generation Assets site-specific Digital Area Survey (DAS) data, or to take the same approach as for auks and Manx shearwater and assume all birds are adults	(2011) indicates that the moult of first-summer birds may begin in mid to late April, taking 130 days to complete and therefore ending by late September. This would therefore mean that the large majority of first-summer birds would retain some degree of first-plumage throughout the summer months and would still be identifiable from adults. Even if a proportion of these birds were indistinguishable from adults this would only serve to make the Applicant's approach more precautionary as it would provide an under-estimate of the likely proportion of immature birds and therefore an over-estimate of the adult proportion. The percentage of adults calculated by the Applicant (58.95%) takes into account all immature age classes whilst remaining precautionary, and has therefore been applied in the assessments. The survival rate data in Horswill and Robinson (2015) have been used throughout offshore wind farm assessments to inform analyses such as Furness (2015) which underpins many of the analyses required as part of offshore wind farm assessments (e.g. apportioning in the non-breeding season, non-breeding season regional population, etc.). It is therefore not consistent with the wider offshore wind farm assessment process to question the suitability of a single element of the survival rate data used by Horswill and Robinson (2015).

1.2 Methodology

1.2.1.1 In the breeding season there are three elements incorporated into the calculation of apportioning values used to establish the impact attributable to relevant SPA populations. These are:

- The colony proportions, calculated using the NatureScot (2018) apportioning approach
- The proportion of adult and immature birds, calculated using site-specific data, where available
- The proportion of non-breeding sabbatical birds, calculated using published evidence.

1.2.1.2 The apportioning approach presented in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057) presented information in relation to all three of these factors, with the first two applied quantitively in relevant assessments and the third applied in a qualitative manner.

1.2.1.3 The colony proportions calculated for SPAs at which kittiwake is a qualifying feature in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057) are applied in this report (Table 1.2).

Table 1.2: Colony proportions for SPAs at which kittiwake is a qualifying feature as calculated in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057).

SPA	Colony proportion
Ailsa Craig	0.004
Howth Head Coast	0.045
Ireland's Eye	0.031
Lambay Island	0.056
North Colonsay and Western Cliffs	0
Rathlin Island	0.067
Saltee Islands	0.002
Skomer, Skokholm and the Seas off Pembrokeshire	0.004
Wicklow Head	0.007

1.2.1.4 For the proportion of adult and immature birds, as discussed in section 1.1, the Applicant applied an approach to calculating the proportion of adult kittiwake present at the Morgan Generation Assets that had previously been applied in other offshore wind farm assessments (SMart Wind, 2015; Ørsted, 2018; The Crown Estate, 2022; The Crown Estate, 2024). This approach provided an adult proportion of 58.95%.

1.2.1.5 In this report, the Applicant has removed the additional step applied for kittiwake which accounts for the presence of older immature age classes which cannot be distinguished from adult birds during site-specific surveys. This therefore provides an adult proportion of 84.11% (which represents the inverse of the immature proportion presented in Table 1.4 of Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057), i.e. 15.89% immature birds).

1.2.1.6 In this report, no consideration is given to non-breeding sabbatical birds, noting that this means that all impacts presented are over-estimates and therefore represents a precautionary approach.

1.2.1.7 At Deadline 1, the Applicant submitted a clarification note which explored the impact the use of data from the Seabirds Count census would have on the assessments conducted in HRA Stage 1 Screening Report (APP-099) and HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) (S_D1_4.7 Annex 4.7 to Response to Hearing Action Point 15: Apportioning Sensitivity Analysis (REP1-012)). It was concluded that, although there were differences in the apportioning values calculated for some SPA features, these would not change the conclusions reached (i.e. no adverse effect on the integrity of any site). In order to provide a comparison with the impacts calculated in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) this report has therefore utilised the apportioning values calculated in Volume 4, Annex 5.5: Offshore ornithology apportioning technical report (APP-057).

1.3 Effects on assessments

1.3.1 Screening

1.3.1.1 Apportioning impacts were used in the HRA Stage 1 Screening Report (APP-099) to identify those SPAs at which there was an impact that was greater than effective zero. Where the impact apportioned to an SPA was greater than effective zero, a likely significant effect (LSE) was identified and the SPA was progressed to HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

1.3.1.2 An impact greater than effective zero was identified for all SPAs at which kittiwake was a qualifying feature for which connectivity was identified in HRA Stage 1 Screening Report (APP-099). The increase in impact that results from the use of a higher adult proportion therefore has no effect on the conclusions of HRA Stage 1 Screening Report (APP-099).

1.3.2 Information to Support Appropriate Assessment

SPAs for consideration

1.3.2.1 LSE was identified for the following SPAs at which kittiwake is a qualifying feature in the HRA Stage 1 Screening Report (APP-099):

- Lambay Island SPA
- Ireland's Eye SPA (and the North-west Irish Sea SPA)
- Howth Head Coast SPA
- Ailsa Craig SPA
- Wicklow Head SPA
- Rathlin Island SPA
- Skomer, Skokholm and the Seas off Pembrokeshire SPA
- North Colonsay and Western Cliffs SPA
- Saltee Islands SPA

- Buchan Ness to Collieston Coast SPA
- Cape Wrath SPA
- East Caithness Cliffs SPA
- Flamborough and Filey Coast SPA
- Troup, Pennan and Lions Heads SPA
- West Westray SPA

1.3.2.2 LSE was concluded for the Buchan Ness to Collieston Coast SPA, Cape Wrath SPA, East Caithness Cliffs SPA, Flamborough and Filey Coast SPA, Troup, Pennan and Lion's Heads and West Westray SPA based on the predicted impact in the non-breeding seasons only. There is no impact from the Morgan Generation Assets on kittiwake at these SPA in the breeding season. The predicted impact is therefore not affected by changes to apportioning values used in the breeding season and therefore no further consideration is given to these SPAs in this report.

1.3.2.3 Conclusions reached for the Ireland's Eye SPA are also considered applicable to the North-west Irish Sea SPA.

1.3.2.4 In addition, whilst connectivity was identified between the Morgan Generation Assets and the kittiwake feature of the North Colonsay and Western Cliffs SPA in the breeding season, this was due to the use of straight line distances which ignore land, over which kittiwake will not fly. As the apportioning approach utilises a distance calculated using a route across the sea only, North Colonsay and Western Cliffs SPA was therefore outside of the foraging range of kittiwake and a 0% apportioning value is concluded for this SPA in the breeding season (see Table 1.2). North Colonsay and Western Cliffs SPA is therefore not affected by changes to apportioning values used in the breeding season and therefore no further consideration is given to this SPA in this report.

Integrity test: Step 1

1.3.2.5 Step 1 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) compared the impact of the Morgan Generation Assets against the baseline mortality of each SPA population.

1.3.2.6 Where the potential impact of the Morgan Generation Assets alone represented less than a 0.05% increase in baseline mortality of the relevant SPA population, then consideration was not given to the potential impact of the Morgan Generation Assets in-combination with other plans and projects. In these instances it was considered that the Morgan Generation Assets would not contribute to the existing in-combination impact as the impact predicted for the Morgan Generation Assets was not measurable and is within the limits of natural variation. If the Morgan Generation Assets alone contributed to an increase in baseline mortality of more than 0.05%, then in-combination impacts were also considered within the integrity test: Step 1.

1.3.2.7 Table 1.3 (collision risk impacts only) and Table 1.4 (displacement and collision impacts combined) provide Step 1 of the Integrity test applied in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) using the increased adult proportion for kittiwake. The increase in baseline mortality for each SPA population is presented in each table alongside the corresponding value as presented in in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

1.3.2.8 The apportioning values calculated for the Morgan Generation Assets were also applied to the impacts for other projects where project-specific apportioning values were unavailable. The impacts associated with these projects have also been re-calculated, where in-combination impacts are considered in Table 1.3 and Table 1.4, to reflect the adult proportion recommended by Natural England and NRW (84.11%).

Table 1.3: Comparison of increases in baseline mortality as a result of collision impacts on kittiwake for relevant SPAs calculated when applying different apportioning approaches and the implications for HRA assessments.

Note:[1] Calculated based on an in-combination impact calculated using a 99.28% avoidance rate.

SPA	Application apportioning approach			Increased adult proportion apportioning approach		
	Increase in baseline mortality (%) – project alone	Increase in baseline mortality (%) – in-combination[1]	Conclusion	Increase in baseline mortality (%) – project alone	Increase in baseline mortality (%) – in-combination[1]	Conclusion
Collision risk impacts only						
Lambay Island	0.01 to 0.04	N/A	No potential for AEOI	0.01 to <0.05	N/A	No potential for AEOI
Ireland's Eye	0.03 to 0.13	1.26	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Integrity test: Step 2	0.04 to 0.17	1.64	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Integrity test: Step 2
Howth Head Coast	0.01 to 0.05	0.53	No potential for AEOI	0.02 to 0.07	0.67	No potential for AEOI
Ailsa Craig	0.01 to 0.03	N/A	No potential for AEOI	0.01 to 0.04	N/A	No potential for AEOI
Wicklow Head	0.01 to 0.03	N/A	No potential for AEOI	0.01 to 0.04	N/A	No potential for AEOI
Rathlin Island	<0.01 to 0.02	N/A	No potential for AEOI	0.01 to 0.02	N/A	No potential for AEOI
Skomer, Skokholm and the Seas off Pembrokeshire	<0.01 to 0.02	N/A	No potential for AEOI	<0.01 to 0.02	N/A	No potential for AEOI
Saltee Islands	<0.01 to 0.02	N/A	No potential for AEOI	<0.01 to 0.02	N/A	No potential for AEOI

Note: Impacts presented reflect the range of collision risk estimates calculated in Volume 4, Annex 5.3: Offshore ornithology collision risk modelling technical report (APP-055) and incorporate both the Applicant's and EWG's preferred parameters.

Table 1.4: Comparison of increases in baseline mortality as a result of displacement and collision impacts combined on kittiwake for relevant SPAs calculated when applying different apportioning approaches and the implications for HRA assessments.

Note:[1] Numbers in brackets present the impact using a displacement rate of 70% and mortality rate of 2% consistent with the approach in REP1-011.

SPA	Application apportioning approach						Increased adult proportion apportioning approach		
	Increase in baseline mortality (%) – project alone		Increase in baseline mortality (%) – in-combination		Conclusion		Increase in baseline mortality (%) – project alone[1]	Increase in baseline mortality (%) – in-combination[1]	Conclusion
	APP-098	REP1-011	APP-098	REP1-011	APP-098	REP1-011			
Total impact (collision plus displacement)									
Lambay Island	0.02 to <0.05	0.07	N/A	0.72	No potential for AEOI	No potential for AEOI	0.03 to 0.06 (0.09)	0.63 (0.92)	No potential for AEOI
Ireland's Eye	0.07 to 0.17	Not considered	1.69	Not considered	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Integrity test: Step 2	N/A	0.10 to 0.24 (0.33)	2.23 (3.29)	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Integrity test: Step 2

SPA	Application apportioning approach						Increased adult proportion apportioning approach		
	Increase in baseline mortality (%) – project alone		Increase in baseline mortality (%) – in-combination		Conclusion		Increase in baseline mortality (%) – project alone[1]	Increase in baseline mortality (%) – in-combination[1]	Conclusion
	APP-098	REP1-011	APP-098	REP1-011	APP-098	REP1-011			
Howth Head Coast	0.03 to 0.06	0.10	0.70	1.03	No potential for AEOI	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Integrity test: Step 2	0.04 to 0.09 (0.13)	0.91 (1.33)	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Integrity test: Step 2
Ailsa Craig	0.02 to 0.04	0.06	N/A	0.74	No potential for AEOI	No potential for AEOI	0.02 to <0.05 (0.07)	N/A	No potential for AEOI
Wicklow Head	0.02 to 0.04	0.05	N/A	0.59	No potential for AEOI	No potential for AEOI	0.02 to <0.05 (0.07)	N/A	No potential for AEOI
Rathlin Island	0.01 to 0.01	0.04	N/A	N/A	No potential for AEOI	No potential for AEOI	0.01 to 0.03 (0.04)	N/A	No potential for AEOI
Skomer, Skokholm and the Seas off Pembrokeshire	0.01 to 0.02	0.03	N/A	N/A	No potential for AEOI	No potential for AEOI	0.01 to 0.03 (0.04)	N/A	No potential for AEOI
Saltee Islands	0.01 to 0.03	0.04	N/A	N/A	No potential for AEOI	No potential for AEOI	0.01 to 0.03 (0.04)	N/A	No potential for AEOI

Notes: Impacts presented are calculated applying a displacement rate of 70% and mortality rate of 2% following the rates used by the Secretary of State as part of the consent decision for the Sheringham Shoal Extension and Dudgeon Extension offshore wind farms and Hornsea Four offshore wind farms.

Impacts presented reflect the range of collision risk estimates calculated in Volume 4, Annex 5.3: Offshore ornithology collision risk modelling technical report (APP-055) and incorporate both the Applicant's and EWG's preferred parameters.

Integrity test: Step 2

Ireland's Eye SPA

Collision risk only

1.3.2.9 The in-combination assessment conducted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for kittiwake at the Ireland's Eye SPA predicted an in-combination collision risk total of 0.5 to 1.7 collisions/annum representing a 0.36 to 1.24% increase in the baseline mortality of the SPA population. The in-combination total calculated in this report (see Appendix A for detailed calculations) is 0.6 to 2.2 collisions/annum representing a 0.47 to 1.64% increase in the baseline mortality of the SPA population (Table A. 1).

1.3.2.10 Calculating apportioned impacts, excluding older immature kittiwake from the apportioning value for the SPA leads to an increase in the baseline mortality metric of approximately 0.11 to 0.40%. Such an increase is not considered to represent a material change in the assessments presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for the kittiwake feature of the Ireland's Eye SPA due to the inclusion of considerable precaution built into the analyses underpinning the assessment. As discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), this would result in the increase in baseline mortality being below 1%. This includes:

- Over-estimation of impacts associated with the projects with connectivity in the breeding season due to immature birds not being accounted for within the apportioning process undertaken for that project
- Over-estimation of impacts associated with the projects with connectivity in the breeding season due to sabbatical birds not being accounted for within the apportioning process undertaken for that project
- It is considered that an avoidance rate of 99.79% is appropriate for kittiwake based on the information presented in Ozsanlav-Harris *et al.* (2023) (see Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report)
- It is considered that the flight speed information provided by Skov *et al.* (2018) provides a far more robust appraisal of kittiwake flight behaviour than any other source of flight height data (see Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report)
- Use of collision risk estimates that represent the assessed turbine scenario at projects that make a significant contribution. The total potential in-combination impact, with the use of as-built scenarios leading to significant reductions in collision risk estimates.

1.3.2.11 It is therefore considered that the no adverse effect on site integrity (AEOI) conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) remains valid when using an increased adult proportion in the breeding season apportioning approach.

Displacement and collision combined

1.3.2.12 The in-combination assessment conducted in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for kittiwake at the Ireland's Eye SPA predicted an in-combination total of 1.1 to 2.3 birds/annum (2.1 to 3.3 birds/annum when using increased displacement and mortality rates as calculated in REP1-011) representing a 0.79 to 1.69% (1.58 to 2.47% in REP1-011) increase in the baseline mortality of the SPA population. The in-combination total calculated in this report (see Appendix A for detailed calculations) is 1.4 to 4.4 birds/annum representing a 1.06 to 3.29% increase in the baseline mortality of the SPA population (Table A. 1 and Table A. 2).

1.3.2.13 As discussed above there is considerable precaution built into analyses that underpin the assessment. As discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), if information representing the best available evidence were to be used, this would result in the increase in baseline mortality being below 1%. It is therefore considered that the no adverse effect on site integrity (AEOI) conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) remains valid when using an increased adult proportion in the breeding season apportioning approach.

Howth Head Coast SPA

Collision risk only

1.3.2.14 The in-combination impact associated with collision risk is below the 1% baseline mortality threshold.

1.3.2.15 It is therefore considered that there is no adverse effect on site integrity (AEOI) for the kittiwake feature of the Howth Head Coast SPA.

Displacement and collision combined

1.3.2.16 The impact on the kittiwake feature of the Howth Head Coast SPA did not surpass the 1% baseline mortality threshold in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and therefore the feature was not progressed to the Step 2 integrity test. The in-combination total calculated in this report (Table A. 3) is 2.2 to 4.4 birds/annum representing a 0.43 to 1.33% increase in the baseline mortality of the SPA population.

1.3.2.17 The calculated increases in baseline mortality are not considered to represent a material change in the assessments presented in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for the kittiwake feature of the Ireland's Eye SPA due to the inclusion of considerable precaution built into the analyses underpinning the assessment. As discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), if information representing the best available evidence were to be used, this would result in the increase in baseline mortality being below 1%. This includes:

- The inclusion of displacement impacts, which is not recommended by Natural England and Natural Resources Wales

- Over-estimation of impacts associated with the projects with connectivity in the breeding season due to immature birds not being accounted for within the apportioning process undertaken for that project
- Over-estimation of impacts associated with the projects with connectivity in the breeding season due to sabbatical birds not being accounted for within the apportioning process undertaken for that project
- It is considered that an avoidance rate of 99.79% is appropriate for kittiwake based on the information presented in Ozsanlav-Harris *et al.* (2023) (see Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report).
- It is considered that the flight speed information provided by Skov *et al.* (2018) provides a far more robust appraisal of kittiwake flight behaviour than any other source of flight height data (see Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report)
- Use of collision risk estimates that represent the assessed turbine scenario at projects that make a significant contribution. The total potential in-combination impact, with the use of as-built scenarios leading to significant reductions in collision risk estimates.

1.3.2.18 It is therefore considered that the no adverse effect on site integrity (AEOI) conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) remains valid when using an increased adult proportion in the breeding season apportioning approach.

1.4 Conclusion

1.4.1.1 As set out in section 1.1, the Applicant has explained why the approach followed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and HRA Stage 1 Screening Report (APP-099) is appropriate whilst remaining precautionary.

1.4.1.2 However, a comparison exercise has been set out in section 1.3, where the apportioning of adult type birds to immature age classes has not been undertaken (as suggested by Natural England and NRW in their Relevant Representations (RR-026 and RR-027)). This has demonstrated that, although the Applicant is confident that the approach undertaken in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and HRA Stage 1 Screening Report (APP-099) is appropriate, it would not make a material difference to the assessment if the method suggested by Natural England and NRW had been applied instead.

1.4.1.3 The assessments presented both in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and this report are therefore considered to remain precautionary and result in conclusions of no adverse effect on the site integrity of any SPA at which kittiwake is a qualifying feature.

1.5 References

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Appendix A: In-combination totals

Table A. 1: In-combination collision totals for kittiwake at the Ireland's Eye SPA.

a – apportioning value unavailable, assumed to be the same as the Morgan Generation Assets (note these values are different to those in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to the removal of older immatures in this report).

Project	Seasonal apportioning values			Seasonal apportioned collision values (99.28% avoidance rate)			Seasonal apportioned collision values (99.79% avoidance rate)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr	0.01	0.001	0.001	0.2	0.0	0.0	0.0	0.0	0.0
Burbo Bank Extension	0.026[a]	0.001	0.001	0.5	0.0	0.0	0.2	0.0	0.0
Erebus	0.016	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Mona Offshore Wind Project	0.016	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.026[a]	0.001	0.001	0.4	0.0	0.0	0.1	0.0	0.0
Morgan Generation Assets	0.026	0.001	0.001	0.1	0.0	0.0	0.0	0.0	0.0
Ormonde	0.026[a]	0.001	0.001	0.0	0.0	0.0	0.0	0.0	0.0
Rampion	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Rampion 2	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Twinhub	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
Walney 3 + 4	0.026[a]	0.001	0.001	0.5	0.0	0.0	0.2	0.0	0.0
West of Orkney	No connectivity	0.001	0.001	-	0.0	0.0	-	0.0	0.0
White Cross	0.026[a]	0.001	0.001	0.4	0.0	0.0	0.0	0.0	0.0
Annual totals									
Scenario 3				2.2			0.6		

Table A. 2: Abundance of kittiwake at projects considered in-combination apportioned to the Ireland's Eye SPA.

a – apportioning value unavailable, assumed to be the same as the Morgan Generation Assets (note these values are different to those in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to the removal of older immatures in this report).

Project	Seasonal apportioning values			Seasonal abundance values		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr	0.010	0.001	0.001	4.8	0.1	0.3
Burbo Bank Extension	0.026[a]	0.001	0.001	34.8	0.2	0.2
Erebus	0.016	0.001	0.001	0.0	1.3	0.4
Mona Offshore Wind Project	0.016	0.001	0.001	5.7	0.3	0.7
Morecambe Offshore Wind Farm: Generation Assets	0.026[a]	0.001	0.001	69.4	1.6	0.5
Morgan Generation Assets	0.026[a]	0.001	0.001	13.4	0.7	0.6
Ormonde	0.026[a]	0.001	0.001	1.6	Unavailable	
Rampion	No connectivity	0.001	0.001	-	0.3	0.3
Rampion 2	No connectivity	0.001	0.001	-	0.1	0.2
Twinhub	No connectivity	0.001	0.001	-	0.1	Unavailable
Walney 3 + 4	0.026[a]	0.001	0.001	4.3	0.4	0.3
West of Orkney	No connectivity	0.001	0.001	-	0.4	0.2
White Cross	0.026[a]	0.001	0.001	1.0	0.1	0.4
Annual totals						
Scenario 3				**156.8**		

Table A. 3: Abundance and collision risk estimates for kittiwake apportioned to the Howth Head Coast SPA.

a – apportioning value unavailable, assumed to be the same as the Morgan Generation Assets (note these values are different to those in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) due to the removal of older immatures in this report).

Project	Seasonal apportioning values			Seasonal abundance values			Seasonal apportioned collision values (99.79% avoidance rate) (collision risk estimates calculated using a 99.28% avoidance rate shown in brackets in total row)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Awel y Môr	0.020	0.002	0.002	9.5	0.3	0.8	0.1	0.0	0.0
Burbo Bank Extension	0.038[a]	0.002	0.002	50.3	0.4	0.3	0.2	0.0	0.0
Erebus	0.033	0.002	0.002	0.1	3.1	1.0	0.0	0.0	0.0
Mona Offshore Wind Project	0.018	0.002	0.002	6.4	0.9	1.8	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.038[a]	0.002	0.002	100.1	3.9	1.1	0.2	0.0	0.0
Morgan Generation Assets	0.038[a]	0.002	0.002	19.3	1.8	1.6	0.1	0.0	0.0
Ormonde	0.038[a]	0.002	0.002	2.3	Unavailable		0.0	0.0	0.0
Rampion	No connectivity	0.002	0.002	-	0.7	0.8	-	0.0	0.0

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Project	Seasonal apportioning values			Seasonal abundance values			Seasonal apportioned collision values (99.79% avoidance rate) (collision risk estimates calculated using a 99.28% avoidance rate shown in brackets in total row)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Rampion 2	No connectivity	0.002	0.002	-	0.1	0.6	-	0.0	0.0
Robin Rigg	0.038[a]	0.002	0.002	6.2	Unavailable		Unavailable		
Twinhub	No connectivity	0.002	0.002	-	0.2	0.0	-	0.0	0.0
Walney 3 & 4	0.038[a]	0.002	0.002	6.1	1.0	0.7	0.2	0.0	0.0
West of Duddon Sands	0.038[a]	0.002	0.002	17.3	Unavailable		Unavailable		
West of Orkney	No connectivity	0.002	0.002	-	0.0	2.5	0.0	0.0	0.0
White Cross	0.033	0.002	0.002	1.2	0.1	0.9	0.0	0.0	0.0
Annual totals									
Scenario 3				**243.3**			**1.0 (3.5)**		