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MONA OFFSHORE WIND PROJECT

HRA Stage 2 Information to Support an Appropriate Assessment

Part Three: Special Protection Areas and Ramsar sites Assessments

Annex E1.3.1: Offshore ornithology ISAA supporting information

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Image of an offshore wind farm

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Glossary

Term	Meaning
Applicant	Mona Offshore Wind Limited.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Mona Offshore Wind Project	The Mona Offshore Wind Project is comprised of both the generation assets, offshore and onshore transmission assets, and associated activities.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects.

Acronyms

Acronym	Description
AoSI	Adverse effect on site integrity
BDMPS	Biologically Defined Minimum Population Scales
CGR	CGR
CPS	CPS
EIA	Environmental Impact Assessment
ExA	Examining Authority
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
LCI	Lower confidence interval
NRW	Natural Resources Wales
PVA	Population Viability Analysis
SNCB	Statutory Nature Conservation Body
SPAs	Special Protection Areas
SSSI	Site of Special Scientific Interest
UCI	Upper confidence interval
UK	United Kingdom

Units

Unit	Description
%	Percentage
km^2	Square kilometres
km	Kilometres
m	Metres

1 ANNEX 1.3.1 OFFSHORE ORNITHOLOGY ISAA SUPPORTING INFORMATION

1.1 Introduction

1.1.1.1 This Annex to the HRA Stage 2 Information to Support an Appropriate Assessment (ISAA) Part Three: Special Protection Areas (SPAs) and Ramsar sites Assessments (Document Reference E1.3 F03) has been provided to address comments from both Natural Resources Wales (Advisory) (NRW (A)) and the Joint Nature Conservation Committee (JNCC) during the Mona Offshore Wind Project examination. This Annex provides ISAA using the range of parameters requested by NRW (A) and the JNCC both pre-application during the Expert Working Group (EWG) meetings and post-application during the examination process – details are provided in Table 1.1.

1.1.1.2 The Applicant acknowledges that a high volume of material for offshore ornithology has been submitted into the Mona Offshore Wind Project examination. In order to draw this information together with the application materials and to address the remaining minor outstanding matters between the Applicant and the SNCBs, the Applicant has undertaken a final update to the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) to repackage the relevant examination materials into a series of Annexes, which have been appended to the ISAA at Deadline 7.

1.1.1.3 This Annex supersedes all additional HRA supporting information submitted into the Mona Offshore Wind Project examination and provides the SNCBs (NRW (A) and the JNCC specifically) with a full assessment following their advice and guidance. Principally, this includes a displacement assessment which considers the full range of displacement and mortality rates advised by the SNCBs (see section 1.2.1), a screening exercise using the lower and upper confidence interval (LCI and UCI) for the Mona Offshore Wind Project alone (see section 1.4.2) and amended age-class proportions during the breeding season within the in-combination assessments which account for site-specific data or assuming that 100% of birds are adults when no site-specific data exists. This differs from the displacement and collision assessments presented in the ISAA (HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)), which only considered single-point estimates of displacement and mortality rates identified by the Applicant based on a review of available evidence and used the mean estimate of collisions, respectively. The Applicant maintains that using a single-point estimate provides a robust and realistic assessment of the impacts but has provided assessments in this Annex based on the full range of displacement and mortality rates and collision estimates in this Annex as requested by NRW (A) and the JNCC.

1.1.1.4 Extensive consultation was undertaken with NRW (A), the JNCC and Natural England during the pre-application phase via the Evidence Plan Process (EPP), including on methodological approaches and input parameters to seek agreement on the approach where possible. This is detailed in the Technical Engagement Plan (Document Reference E4 F01) and Annex D of the Technical Engagement Plan Appendices Part 1 (A to E) (Document Reference E4.1 F01). Through these discussions, it was not possible to discuss and agree on all aspects of the methodologies.

1.1.1.5 A summary of relevant representations and written representations post-application consultation and feedback received from the SNCBs during examination is presented in Table 1.1 alongside how the comments have been considered by the Applicant.

Table 1.1: Post-application consultation and engagement relevant to the supporting information presented within this Annex

Consultee and form of consultation	Comment summary	Response to issue raised and/or where considered in this Annex
NRW (A) Relevant Representation	NRW (A) notes that the Applicant's approach and presentation of apportionment of predicted impacts is, in places, difficult to follow and unclear. NRW (A) require clarification (potentially to include a full worked example for a species and site of all apportioning (age classes and apportionment of impacts)) and/or updates to the assessment are required.	This Annex brings together the key assessment information in a single document, with clear signposting to the source of this information and where further supporting details can be found within the application documents.
The JNCC Relevant Representation	JNCC notes that many aspects of the assessment are difficult to follow, what has been done, or where values have come from.	
NRW (A) Written Representations at Deadline 1	NRW (A) highlighted that they would base their advice and conclusions on assessments that consider the full range of advised displacement and mortality rates that follow SNCB guidance. As the apportioned impacts across the full range of advised displacement and mortality rates are currently not available for each designated site in the HRA Stage 1 Screening Report (Document Reference E1.4 F04) or HRA Stage 2 Information to Support Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments (Document Reference E1.3 F03), they therefore suggest that the Applicant provides this information into the examination as soon as possible. NRW (A) highlighted that they are not advising that the HRA be based solely on the upper end of the % displacement and % mortality rates advised (e.g. 70% displacement and 10% mortality for auks), but advises that in order to account for the large degree of uncertainty regarding displacement rates and effects that the assessments consider a range of potential rates and effects rather than focussing on a single figure as the Applicant has done in their HRA application documents.	This Annex (section 1.4.1) includes the presentation of displacement impacts apportioned to designated sites for the full range of displacement and mortality rates recommended by the SNCBs to aid the SNCB's interpretation of the apportioned impacts on individual SPAs.
The JNCC's Written Representations at Deadline 1	JNCC notes that some aspects of JNCC advice also appear to have been taken on board in some circumstances but not in others, despite agreement during pre-application meetings and correspondence. For instance, specific displacement rates being used in the HRA and EIA.	
	JNCC do not agree that single values of displacement and mortality should be used for analysis of population impacts. JNCC advises that a range of displacement mortality values	

Consultee and form of consultation	Comment summary	Response to issue raised and/or where considered in this Annex
	are taken through to the assessment of population impacts (SNCBs, 2022).	
NRW's written feedback following a meeting on 9 September 2024 (received via email on 18 September 2024)	NRW (A) advised that the presentation of apportioned impact should include the following: • age class apportioning as well as apportioning value to colony. • the mortality rate and data source (assume will be based on adult survival rates from Horswill and Robinson 2015)). • the figures for the annual summed total impacts as well as per season.	These parameters are presented for each species and SPA in section 1.3.
	NRW (A) advise that where the Mona Offshore Wind Project's predicted impact equates to greater than 0.05% baseline mortality at any point within the advised range of displacement and mortality rates, then the site/feature combination is taken through to in-combination assessment and not just based on the Applicant's identified % displacement and % mortality rates, as has been currently done.	The in-combination assessments based on the advised range of displacement and mortality rates are presented in section 1.4.3. The Applicant can confirm that an in-combination assessment is presented if a 0.05% increase in baseline mortality is surpassed under any of the presented scenarios, including the upper end of the SNCBs advice.
	NRW (A) suggest for the apportioned impacts (when using the full range of displacement scenarios) the presentation of tables showing predicted impacts across range and highlighting where within the range 1% baseline mortality is exceeded.	The Applicant has provided matrix tables following each in-combination assessment which provides NRW (A) with this information on when the 1% threshold is surpassed.
JNCC's written feedback following a meeting on 4 September 2024 (received via email on 10 September 2024)	The JNCC recommends that the presentation of apportioned displacement impacts within the HRA includes the following information: • Site • Colony count (Year) • Baseline mortality • Un-apportioned mortalities (per bio-season) • Age-class apportioning (per bio-season) • Apportioning value (per bio-season) • Impact range (per bio-season) • Increase in baseline mortality (per bio-season)	These parameters are presented for each species and SPA in section 1.3 for displacement impacts. The un-apportioned mortalities are presented fully within Table 1.3 and repeated before each results table in section .
	The JNCC recommend the presentation of apportioned collision impacts within the HRA includes the following information: • Site • Colony count (year) • Baseline mortality • Un-apportioned mean collision mortality (LCL, UCL) (per bio-season) • Age-class apportioning (per bio-season)	These parameters are presented for each species and SPA in section 1.3. The un-apportioned mortalities are presented fully within Table 1.3 and repeated before each results table in section .

Consultee and form of consultation	Comment summary	Response to issue raised and/or where considered in this Annex
	• Apportioning value (per bio-season) • Apportioned mean collision mortality (LCL, UCL) (per bio-season) • Increase in baseline mortality mean (LCL, UCL) (per bio-season)	
JNCC's written feedback received 24 October 2024 following meeting on 14 October 2024	JNCC requested that the gap-filled projects be included within the in-combination assessments.	The Applicant has updated this supporting information to include gap-filled historical project estimates within the in-combination assessments presented in section 1.4.3. See Volume 2, Chapter: Offshore Ornithology (Document Reference F2.5 F04) for details of the gap-filling methodology.
	JNCC provided multiple worked examples of how they tried to calculate the apportioned impact to individual SPAs but were unable to replicate the same apportioned impacts as the Applicant.	The Applicant has provided revised in-combination tables in section which provides JNCC with all the required parameters to enable them to replicate the Applicant's predicted impacts (un-apportioned and apportioned) to each SPA for all species considered using the Applicant's methods as described within section 1.3.4.
	The JNCC advised that stable-age structures should not be used within the in-combination assessment. The JNCC requested that where an individual can not be identified easily to a specific age-class, then it should be considered an adult.	The Applicant has taken the advice of the JNCC and NRW (A) for the Mona Offshore Wind Project alone assessment (as done within Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04)) and has considered all birds not able to be identified to a specific age as adults. The Applicant has presented the in-combination assessments using site-specific data where available (see Table 1.5) and where not available it is presumed that 100% of birds are adults. The Applicant considers that this approach inflates the impact and results in an overly precautionary presumption and does not use the best-available scientific evidence on age class structures. The Applicant maintains that using the stable-age structure within the in-combination assessments represents the best available evidence (Furness, 2015) and highlights that there is precedent for this approach being used in HRAs for multiple other consented offshore wind farms and The Crown Estates' Plan Level HRAs (both Round 4 and Round 5).
JNCC and NRW (A) verbal feedback received in meeting 29 October 2024	The JNCC repeated their written advice (see row above), with NRW (A) confirming they are of the same opinion.	The Applicant welcomes JNCCs and NRW (A)'s comments and refers to the specific responses above.

Consultee and form of consultation	Comment summary	Response to issue raised and/or where considered in this Annex
NRW (A)'s and the JNCC's Deadline 4 submissions	The JNCC and NRW (A) requested that the gap-filled projects be included within the in-combination assessments.	The Applicant has updated this supporting information to include gap-filled historical project estimates within the in-combination assessments presented in section 1.4.3. See Volume 2, Chapter: Offshore Ornithology (Document Reference F2.5 F04) for details of the gap-filling methodology.
NRW (A)'s and the JNCC Deadline 5 submissions	The JNCC and NRW (A) requested that the impacts from Morgan Generation Assets and Morecambe Generation Assets are updated to those in the application documents and not PEIR.	The Applicant has updated this supporting information to include the updated project estimates for Morgan Generation Assets and Morecambe Generation Assets within the in-combination assessments presented in section 1.4.3.
NRW(A)'s Deadline 6 submission and verbal feedback received in meeting 16 December 2024	NRW(A) considered the in-combination assessment of gannet at Grassholm SPA within Offshore ornithology additional supporting in-combination assessment information in line with SNCB advice submitted at Deadline 5 could be over-precautionary and therefore NRW (A) was unable to confirm its position in relation to adverse effect on site integrity.	The Applicant has addressed NRW (A)'s concerns in the Revised Assessment for Northern Gannet at Grassholm SPA submitted at Deadline 6. This assessment is now presented in sections 1.4, 1.5 and Appendix B:.

1.1.2 Considerations

1.1.2.1 The Applicant has worked to produce the numeric outputs requested by NRW (A) and the JNCC in relation to the ornithological assessments for the Mona Offshore Wind Project. As such, the information presented in this Annex includes:

- Displacement and collision impact assessments, which use a range-based approach rather than single point estimates; and
- In-combination assessments using updated age class proportions which assume 100% are adults during the breeding season where site-specific age class data for other projects are unavailable.

1.1.2.2 The Applicant maintains that a scenario of 50% displacement and 1% mortality for black-legged kittiwake, common guillemot, Manx shearwater and razorbill and 70% displacement and 1% mortality for northern gannet and assessing the mean collisions, as presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) is both robust and precautionary for the purposes of the assessment. The Applicant does not consider that the most conservative displacement scenarios considered in this Annex (i.e. 70-80% displacement and 10% mortality rate) are a realistic worst-case scenario as this level of impact has not been evidenced at previous offshore wind projects such as Beatrice (reviewed by APEM, 2022; MacArthur Green, 2023).

1.1.2.3 As outlined in section 1.2.1, the JNCC was the only SNCB involved in the EWGs for the Mona Offshore Wind Project that requested the Applicant provide a displacement assessment for black-legged kittiwake. Both NRW (A) and Natural England have stated there is insufficient evidence to undertake a displacement assessment for black-

legged kittiwake. No consented wind farm project within English or Welsh waters has had to provide an assessment of displacement for black-legged kittiwake.

1.1.2.4 The approach suggested by NRW (A) and JNCC to assume that all birds recorded during the site-specific surveys for all projects within the in-combination assessments are adult birds (where no age-class data exists from the site-specific surveys) is over-precautionary and considered to be biologically unrealistic given that populations will always include a material proportion of immature birds. This approach requires the Applicant re-calculate the impacts from other consented offshore wind projects included in the in-combination assessment from what was included in their applications to assume that all birds are 100% adults (where there is no site-specific age-class data). It is, therefore, the Applicant's view that the assessments presented within this document hyperinflate the potential impacts and do not use the 'best-scientific' evidence on the age-class structures and displacement rates. Given this, the Applicant advises that the predicted impacts presented in this document should not be considered in isolation but balanced with biological considerations and outputs from more realistic scenarios.

1.1.2.5 The final point to highlight is the potential application of macro-avoidance for northern gannet. Macro-avoidance is the idea that a bird cannot concurrently be at risk of collision if it has also been displaced. During the EWGs the SNCBs agreed that a 70% reduction to the input parameters of the collision risk models could be applied to account for macro-avoidance (see D3.13 of the Technical Engagement Plan Appendices – Part 1 (A to E) (Document Reference E4.1 F01)). The Applicant has presented the collision impact on northern gannet within Volume 6, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (Document Reference F6.5.3 F03) with and without macro-avoidance. As agreed during the EWG the HRA can be based on collision impacts with 70% macro-avoidance and therefore, the Applicant has presented this impact within section 1.4.2 for the project alone. However, as historical projects did not present an assessment with and without macro-avoidance collision impact, the Applicant has not corrected the collisions estimates to account for macro-avoidance. This approach has been adopted to ensure a consistent approach within the in-combination assessments. Alternative macro-avoidance scenarios have, however, been considered in relation to northern gannet from Grassholm SPA as advised by NRW (A) – this information is presented in Appendix B: the in-combination impacts for northern gannet are likely to be an overestimation.

1.1.2.6 The Applicant notes that in their written representations, both the JNCC and NRW (A) stated that they would not base their consideration of impact solely on the worst-case assessment scenario but would consider the predicted impacts for the full range of advised assessment scenarios.

1.1.2.7 The impacts in the tables presented in this document have been rounded to one or two decimal places. Therefore, the 'annual total' shown may not match equally to the sum of the seasonal impacts or individual projects due to this rounding.

1.1.3 Structure of this Annex

1.1.3.1 This Annex is comprised of the following sections in accordance with advice from NRW (A) and the JNCC:

- Section 1.1 provides the background to this technical note, its purpose and the post-application stakeholder engagement that has informed the development of this Annex.

- Section 1.2 provides a summary of what has been included within the submitted EIA and HRA documents (Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04) and HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)) and where there is deviation from what the SNCBs have requested to be included, which is provided within this Annex. Section 1.2 also clarifies what is presented within the results section (section 1.3).
- Section 1.3 provides information which can be found in the application documents but has been represented within this Annex to aid the flow of information which has informed the assessments presented in this Annex.
  - Section 1.3.2 presents the impacts of the displacement and collision assessments. This information is taken from Volume 6, Annex 5.2: Offshore Ornithology Displacement Technical Report (Document reference F6.5.2 F03) and Volume 6, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (Document Reference F6.5.3 F02), respectively.
  - Section 1.3.3 presents the seasonal age-class apportioning taken from the site-specific DAS for the Mona Offshore Wind Project which was used within the Mona Offshore Wind Project alone assessment. This information is taken from Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03).
  - Section 1.3.4 presents how the seasonal age-class apportioning has been undertaken for the in-combination assessments.
  - Section 1.3.4.1 presents the baseline mortality rates required for each species. This information is taken from Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F03).
  - Section 1.3.6 provides the method by which the SPA apportioning values have been calculated. This information is taken from Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5 F03).
- Section 1.4 presents the apportioning results for all SPAs which are included within Appendix A of the HRA Stage 1 Screening Report (Document Reference E1.4 F03). Section 1.4 replicates the tables from Appendix A of the HRA Stage 1 Screening Report (Document Reference E1.4 F03) but with the added range of impacts as requested by the SNCBs.
  - Section 1.4.1 presents the displacement tables;
  - Section 1.4.2 presents the collision tables; and
  - Section 1.4.3 presents the in-combination tables (if required).
- Section 1.5 provides the PVAs which are required for the project alone or the project in-combination.
- Section 1.6 provides the conclusions when considering the full range of predicted impacts on species and undertaking PVAs when impacts predicted resulted in an increase in baseline mortality of >1%.

1.2 Summary of information presented at application

1.2.1 Displacement assessment

1.2.1.1 The full range (1 to 100% for both displacement and mortality rates) of predicted displacement impacts are presented within the individual species matrix tables for the project alone within Volume 6, Annex 5.2: Offshore Ornithology Displacement Technical Report (Document Reference F6.5.2 F03). Within these matrix tables, the SNCBs advised displacement and mortality rates (Table 1.2) are included.

1.2.1.2 However, the proportion of the population which may undergo displacement and mortality presented in the HRA Stage 1 Screening (Document Reference E1.4 F03) is based on the Applicant's identified displacement and mortality rates (50% displacement and 1% mortality for Atlantic puffin, black-legged kittiwake, common guillemot, Manx shearwater and razorbill and 70% displacement and 1% mortality for northern gannet). The values used within the Applicant's document replicated those adopted by recently consented windfarms in their applications.

1.2.1.3 As outlined in Table 1.1, the JNCC and NRW (A) disagree with the use of single value estimates in the HRA Stage 1 Screening (Document Reference E1.4 F03) and the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) for analysis of likely significant effects and Adverse Effects on Site Integrity (AEoSI) (Table 1.1).

1.2.1.4 Therefore, the Applicant has presented further supporting information in this Annex and tabulated the apportioned impacts to SPAs in section 1.4.1 for the Mona Offshore Wind Project and section 1.4.3 for in-combination assessments using the range of displacement and mortality values advised by SNCBs (as shown in Table 1.2).

1.2.1.5 The predicted displacement mortalities presented at application within Volume 6, Annex 5.2: Offshore Ornithology Displacement Technical Report (Document Reference F6.5.2 F03) are summarised in Table 1.3 using the range of displacement and mortality rates from Table 1.2. Table 1.8 to Table 1.12 present the apportioned displacement impacts for each SPA considered within the HRA Stage 1 Screening Report (Document Reference E1.4 F03).

1.2.1.6 It should be noted that for the auk species (specifically common guillemot and razorbill) an alternative approach of 70% displacement and 2% mortality is presented alongside the minimum impact (30% displacement and 1%) and the maximum impact (70% displacement and 10% mortality), as these parameters have recently been accepted and used by the Secretary of State within the HRAs for Hornsea Two/Three/Four, East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard, Sheringham Shoal and Dudgeon Extension Projects (SEP and DEP).

1.2.1.7 The JNCC was the only SNCB involved in the Expert Working Groups for the Mona Offshore Wind Project that requested the Applicant provide a displacement assessment for black-legged kittiwake. Both NRW (A) and Natural England have stated there is insufficient evidence to undertake a displacement assessment for black-legged kittiwake. As requested by the JNCC, a displacement assessment for black-legged kittiwake is included in this Annex. The evidence that was presented alongside the request for 30-70% displacement and 1-10% mortality (specifically, Peschko *et al.*, 2020; Vanermen *et al.*, 2016; Leopold *et al.*, 2013 within D.3.14 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)) does not support the displacement and mortality rates suggested, with very high variability around the impacts (even some positive effects). To date no consented offshore

windfarm located in English or Welsh waters has presented an assessment of displacement for black-legged kittiwake.

1.2.1.8 Therefore, for black-legged kittiwake, the Applicant has also assessed an alternative approach of 30% displacement and 3% mortality which is in line with NatureScot guidance (NatureScot, 2023) and used for recent assessments within Scottish waters (e.g. Ossian Offshore Wind Farm and West of Orkney Wind Farm).

Table 1.2: Displacement and mortality rates advised by the SNCBs and reference of when this advice was received.

Species	SNCB advised displacement rate range and basis of the Applicant's EIA at application		SNCB advised mortality rates range and basis of the Applicant's EIA at application		Specific request from the SNCBs to use these rates	
	JNCC	NRW	JNCC	NRW	JNCC	NRW
Common guillemot	30 to 70%	30 to 70 %	1 to 10%	1 to 10%	JNCC did not disagree with using these figures as presented in D.3.9 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01).	NRW confirmed that 30-70% displacement and 1-10% mortality for auks following EWG3 in November 2022 (D.4.3 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)).
Razorbill	30 to 70%	30 to 70 %	1 to 10%	1 to 10%		
Atlantic puffin	30 to 70%	30 to 70 %	1 to 10%	1 to 10%		
Black-legged kittiwake	30 to 70%	**No assessment required**	1 to 10%	**No assessment required**	JNCC requested 30-70% displacement and 1-10% mortality in June 2022 (D.3.14 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)).	NRW confirmed during Examination in their written representation that no black-legged kittiwake assessment for displacement is required due to an insufficient evidence base.
Manx shearwater	30 to 70%	30 to 70%	1 to 10%	1 to 10%	JNCC initially requested 1-10% displacement and 1-10% mortality in June 2022 (D.3.14 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)). This then changed to 'whole matrices' (D.4.4 in Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01))	NRW initially stated '*there is currently no evidence for any particular range of displacement rates (1-10%, 30-70% or any other) for this species from offshore wind farms. NRW (A) welcome that the whole matrices will be presented in the PEIR.* (D.4.3 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01). Within their written representations NRW requested that 30-70% displacement and 1-10% mortality (as with auks) be used.

Species	SNCB advised displacement rate range and basis of the Applicant's EIA at application		SNCB advised mortality rates range and basis of the Applicant's EIA at application		Specific request from the SNCBs to use these rates	
	JNCC	NRW	JNCC	NRW	JNCC	NRW
Northern gannet	60 to 80%	60 to 80%	1 to 10%	1 to 10%	JNCC did not disagree with using these figures as presented in D.3.9 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)	NRW confirmed that 60-80% displacement and 1-10% mortality for northern gannet following EWG3 in November 2022 (D.4.3 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)) was appropriate.

1.2.2 Collision risk assessment

1.2.2.1 Similarly to displacement, the collision mortalities presented in the HRA Stage 1 Screening (Document Reference E1.4 F03) used a single value estimate (mean collision mortality).

1.2.2.2 As outlined in Table 1.1, the JNCC and NRW (A) disagree with the use of single value estimates in the HRA Stage 1 Screening (Document Reference E1.4 F03) and HRA Stage 2 ISAA Part Three: SPA and Ramsar sites Assessments (Document Reference E1.3 F03) for analysis of impacts on SPAs (Table 1.1).

1.2.2.3 Therefore, as recommended by the JNCC and NRW (A), the Applicant has presented further supporting information in this Annex. The range of predicted collision impacts was presented at application (within Volume 6, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (Document Reference F6.5.3 F03)). The Applicant has populated the apportioned impacts to SPAs using the LCI and UCI in Table 1.12 to Table 1.17.

1.3 Information required to inform assessments

1.3.1.1 The following information is required to present impacts using a range-based approach including the apportioned impacts on SPAs (as presented within Appendix A of the HRA Stage 1 Screening Report (Document Reference E1.4 F03)).

1.3.2 Project alone collision and displacement impacts

1.3.2.1 Table 1.3 presents the project alone predicted impacts from collision, displacement and collision and displacement combined (where required) for each species considered within this Annex. The information is taken from Volume 6, Annex 5.2: Offshore Ornithology Displacement Technical Report (Document reference F6.5.2 F03) and Volume 6, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (Document Reference F6.5.3 F03), respectively.

1.3.2.2 The predicted mortalities from displacement are presented for the Applicant's identified rates (50% displacement and 1% mortality), followed by the SNCBs advised range of displacement and mortality rates in brackets (see Table 1.2 for further information).

1.3.2.3 The modelled mortalities from collisions are presented with the mean value outside the brackets and the lower confidence interval (LCI) and upper confidence interval (UCI) in brackets.

1.3.2.4 These predicted mortality estimates feed into the assessment tables presented in section 1.4.1 for displacement and section 1.4.2 for collisions.

Table 1.3: Predicted collision and displacement impacts during the operations and maintenance phase (all age classes).

Species	Season	Mortality - Collisions (using species-group avoidance rates)[1]	Mortality - Collisions (using species-specific avoidance rates)[2]	Mortality - Displacement (see Table 1.2 for species-specific rates presented)[3]	Mortality - Combined (using species-group avoidance rates)[1]	Mortality - Combined (using species-specific avoidance rates)[2]
Common guillemot	Breeding (March to July)	-	-	21 (13 to 295)	21 (13 to 295)	21 (13 to 295)
	Non-breeding (August to February)	-	-	19 (11 to 263)	19 (11 to 263)	19 (11 to 263)
Razorbill	Pre-breeding migration (January to March)	-	-	10 (6 to 135)	10 (6 to 135)	10 (6 to 135)
	Breeding (April to July)	-	-	0 (0 to 6)	0 (0 to 6)	0 (0 to 6)
	Post-breeding migration (August to October)	-	-	0 (0 to 6)	0 (0 to 6)	0 (0 to 6)
	Non-breeding (November to December)	-	-	2 (1 to 29)	2 (1 to 29)	2 (1 to 29)
Atlantic puffin	Breeding (April to August)	-	-	0 (0 to 1)	0 (0 to 1)	0 (0 to 1)
	Non-breeding (September to March)	-	-	0 (0 to 2)	0 (0 to 2)	0 (0 to 2)
Northern gannet (collisions corrected for 70% macro-avoidance[4])	Pre-breeding (December to February)	0 (0 to 0)	-	0 (0 to 2)	0 (0 to 2)	-
	Breeding (March to September)	1 (0 to 4)	-	2 (2 to 20)	3 (2 to 24)	-
	Post-breeding (October to November)	0 (0 to 0)	-	0 (0 to 5)	0 (0 to 5)	-
Northern fulmar	Pre-breeding (December)	0 (0 to 0)	-	-	0 (0 to 0)	-

Species	Season	Mortality - Collisions (using species-group avoidance rates)[1]	Mortality - Collisions (using species-specific avoidance rates)[2]	Mortality - Displacement (see Table 1.2 for species-specific rates presented)[3]	Mortality - Combined (using species-group avoidance rates)[1]	Mortality - Combined (using species-specific avoidance rates)[2]
	Breeding (January to August)	0 (0 to 2)	-	-	0 (0 to 2)	-
	Post-breeding (September to October)	0 (0 to 0)	-	-	0 (0 to 0)	-
	Non-breeding (November)	0 (0 to 0)	-	-	0 (0 to 0)	-
Black-legged kittiwake	Pre-breeding (January to February)	9 (3 to 18)	3 (1 to 5)	3 (2 to 40)	12 (5 to 58)	6 (3 to 45)
	Breeding (March to August)	16 (6 to 32)	5 (2 to 9)	4 (2 to 51)	20 (8 to 83)	9 (4 to 60)
	Post-breeding (September to December)	8 (3 to 18)	3 (1 to 5)	3 (2 to 39)	12 (5 to 57)	6 (3 to 44)
Herring gull	Breeding (March to August)	0 (0 to 0)	0 (0 to 0)	-	0 (0 to 0)	0 (0 to 0)
	Non-breeding (September to February)	1 (1 to 3)	1 (0 to 3)	-	1 (1 to 3)	1 (0 to 3)
Lesser black-backed gull	Pre-breeding (March)	1 (0 to 2)	1 (0 to 1)	-	1 (0 to 2)	1 (0 to 1)
	Breeding (April to August)	0 (0 to 1)	0 (0 to 1)	-	0 (0 to 1)	0 (0 to 1)
	Post-breeding (September to October)	0 (0 to 0)	0 (0 to 0)	-	0 (0 to 0)	0 (0 to 0)
	Non-breeding (November to February)	1 (0 to 2)	1 (0 to 1)	-	1 (0 to 2)	1 (0 to 2)
Great black-backed gull	Breeding (March to August)	2 (1 to 3)	0 (0 to 1)	-	2 (1 to 3)	0 (0 to 1)

Species	Season	Mortality - Collisions (using species-group avoidance rates)[1]	Mortality - Collisions (using species-specific avoidance rates)[2]	Mortality - Displacement (see Table 1.2 for species-specific rates presented)[3]	Mortality - Combined (using species-group avoidance rates)[1]	Mortality - Combined (using species-specific avoidance rates)[2]
	Non-breeding (September to February)	3 (1 to 7)	0 (0 to 1)	-	3 (1 to 7)	0 (0 to 1)
Manx shearwater	Pre-breeding (March)	0 (0 to 0)	-	0 (0 to 0)	0 (0 to 0)	0 (0 to 0)
	Breeding (April to August)	0 (0 to 0)	-	6 (4 to 87)	6 (4 to 87)	6 (4 to 87)
	Post-breeding (September to October)	0 (0 to 0)	-	0 (0 to 1)	0 (0 to 1)	0 (0 to 1)

[1] Species-group avoidance rates are 0.9928 for black-legged kittiwake, northern fulmar, northern gannet and Manx shearwater and 0.9939 for great black-backed gull, herring gull and lesser black-backed gull. The number outside the brackets is the mean predicted impact with the LCI and UCI presented in the brackets.

[2] Species-specific avoidance rates are 0.9952 for herring gull, 0.9954 for lesser black-backed gull, 0.9979 for black-legged kittiwake and 0.9991 for great black-backed gull. The number outside the brackets is the mean predicted impact with the LCI and UCI presented in the brackets.

[3] The range of displacement rates used (within the brackets) is presented in Table 1.2. This is 30-70% displacement and 1-10% mortality for Atlantic puffin, common guillemot, razorbill, black-legged kittiwake and Manx shearwater and 60-80% displacement and 1-10% mortality for northern gannet. The figure outside the brackets uses the Applicant's identified rate, which is 50% displacement and 1% mortality for Atlantic puffin, common guillemot, razorbill, black-legged kittiwake and Manx shearwater and 70% displacement and 1% mortality for northern gannet.

[4] The use of 70% macro-avoidance has been agreed with the SNCBs (D3.13 of the Technical Engagement Plan Appendices – Part 1 (A to E) (Document Reference E4.1 F01)). The 70% macro-avoidance has been applied to the inputted density estimates.

1.3.3 Seasonal age-class apportioning for the Mona Offshore Wind Project alone assessment

1.3.3.1 The age-class apportioning values for the Mona Offshore Wind Project alone assessment are presented in Table 1.4 of Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5). The Applicant confirms that during the breeding and non-breeding season, age-class was calculated from site-specific DAS, or if age-class identification was not possible from site-specific DAS then it was presumed that 100% of birds were adults.

1.3.3.2 The age-class apportioning values are represented in Table 1.4 to ensure a clear flow information and allow subsequent calculations of apportioned impacts from the Mona Offshore Wind Project in section 1.4.

1.3.3.3 The age-class apportioning values feed into the assessment tables presented in section 1.4.1 for displacement and section 1.4.2 for collisions.

Table 1.4: Seasonal age-class apportioning for the Mona Offshore Wind Project.

Species	Season	Adult %	Immatures %
Atlantic puffin	Breeding (March to July)	100%	0%
	Non-breeding (August to February)	100%	0%
Common guillemot	Breeding (March to July)	100%	0%
	Non-breeding (August to February)	100%	0%
Razorbill	Breeding (April to July)	100%	0%
	Non-breeding (August to March)	100%	0%
Northern gannet	Breeding (March to September)	93.58%	6.42%
	Non-breeding (October to February)	96.43%	3.57%
Black-legged kittiwake	Breeding (March to August)	95.36%	4.64%
	Non-breeding (September to February)	92.01%	7.99%
Herring gull	Breeding (March to August)	80.00%	20.00%
	Non-breeding (September to February)	75.61%	24.39%
Lesser black-backed gull	Breeding (April to August)	81.82%	18.18%
	Non-breeding (September to March)	86.96%	13.04%
Great black-backed gull	Breeding (March to August)	83.33%	16.67%
	Non-breeding (September to February)	70.49%	29.51%
Manx shearwater	Breeding (April to August)	100%	0%
	Non-breeding (September to March)	100%	0%

1.3.4 Seasonal age-class apportioning for the in-combination assessments

1.3.4.1 Within the in-combination assessments the Applicant has used the proportions of immatures to adults within the Appendix A tables of Furness (2015) for all projects during the non-breeding season

1.3.4.2 The SNCBs advised that when considering the age-class apportioning during the breeding season for all projects a precautionary approach would be to presume all birds are adults in the absence of site-specific data.

1.3.4.3 For the purpose of this Annex, and in line with SNCB advice, the Applicant has taken into account site-specific age-class data for other projects considered within the in-combination assessments during the breeding season where this is available. Where site-specific age-class data is unavailable, the Applicant has assumed that 100% of birds are adults during the breeding season. Of the species requested to be considered in this Annex, only black-legged kittiwake and northern gannet can be aged via their plumage during baseline surveys.

1.3.4.4 Age-class proportion information was available for six of the 17 projects considered within the in-combination assessment, these are Awel y Môr Offshore Wind Farm, Erebus Floating Wind Farm, Llŷr 1 Floating Offshore Wind Farm, Mona Offshore Wind Project, Morecambe Generation Assets and Morgan Generation Assets. For the remaining 11 projects, 100% of birds have been assumed adults during the breeding season. The Applicant does not consider that these numbers illustrate the true scale of the impacts as, in reality, a proportion of the birds within a population will be immatures, thus the predicted impacts are overestimated.

1.3.4.5 A breakdown of age-class data for black-legged kittiwake and northern gannet for the six projects outlined above is detailed in Table 1.5.

Table 1.5: Site-specific age-class data during the breeding season.

Project	Percentage of birds considered adult		Document and reference
	Black-legged kittiwake	Northern gannet	
Awel y Môr Offshore Wind Farm	Unavailable	93.5%	Report 5.2: Report to Inform Appropriate Assessment (Awel y Môr, 2022)
Erebus Floating Wind Farm	100% (only two birds were recorded)	99.0%	Technical Appendix 11.1 – Baseline Data (Erebus, 2021a)
Llŷr 1 Floating Offshore Wind Farm	77.39%	95.99%	Volume 6: Appendix 22A – Marine Ornithology Baseline (Llŷr 1 Floating Wind Farm, 2024)
Mona Offshore Wind Project	95.36%	93.58%	Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document reference F6.5.5 F03)
Morecambe Generation Assets	96.5%	73.3%	Appendix 12.2 Aerial Survey Two Year Report March 2021 to February 2023 (Morecambe Generation Assets, 2024a)
Morgan Generation Assets	84.11%	94.94%	Volume 4, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Morgan Generation Assets, 2024a)

1.3.5 Baseline mortality rates used

1.3.5.1 Whilst the baseline mortality rates were presented in the application in Table 5.15 of Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04), the Applicant has again presented these rates in this Annex. This is to ensure a clear flow information and to allow for calculations of subsequent apportioned impacts in section 1.4.

1.3.5.2 These baseline mortality rates feed into the assessment tables presented in section 1.4.1 for displacement and section 1.4.2 for collisions.

Table 1.6: Baseline adult survival and mortality rates (Horswill and Robinson, 2015).

Species	Adult survival rate	Adult mortality rate
Common guillemot	0.939	0.061
Razorbill	0.895	0.105
Manx shearwater	0.870	0.130
Northern gannet	0.919	0.081
Black-legged kittiwake	0.854	0.146
European herring gull	0.834	0.166
Lesser black-backed gull	0.885	0.115
Great black-backed gull	0.930	0.070

1.3.6 Apportioning values to individual SPAs

1.3.6.1 Whilst the apportioning values for each site and colony are presented in Volume 6, Annex 5.5: Offshore ornithology apportioning technical report (Document reference F6.5.5 F03), the Applicant has presented these values in this technical note for each SPA and species considered. This is to ensure a clear flow of information and to allow for calculations of apportioned impacts.

1.3.6.2 The apportioning values for each species, from each site during each bio-season are presented within the respective results table within section 1.4.

1.4 Additional HRA information as requested by the SNCBs

1.4.1 Apportioned displacement impacts from the Mona Offshore Wind Project alone

1.4.1.1 The bio-seasons included within the following tables replicate the tables presented in Appendix A of the HRA Stage 1 Screening (Document Reference E1.4 F03). Therefore, some sites do not have non-breeding season impacts apportioned as they represent less than 1% of the relevant Biologically Defined Minimum Population Scales (BDMPS) and were screened out of assessment during those periods (in line with SNCB advice following the fifth EWG meeting (see Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)). However, within the in-combination tables (section 1.4.3) the complete annual impact is presented (including non-breeding impacts even when a site represents <1% of the BDMPS).

Atlantic puffin

1.4.1.2 As presented in Table 1.3, the breeding season impact for Atlantic puffin was 0 (0 to 1 birds) during the breeding season and during non-breeding season impact 0 (0 to 2) birds and the age-class apportioning is 100% of birds are considered adults (Table 1.4). The baseline mortality for Atlantic puffin is 0.094 (Table 1.6).

Table 1.7: Adult Atlantic puffin mortality due to displacement apportioned to SPAs.

Site	Colony count (year)	Baseline Mortality (0.094)	Bio season	Apportioning Value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]
Saltee Islands SPA	1,638 (2016/2021)	154	Breeding	1.56%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)
Lambay Island SPA	288 (2015)	27	Breeding	0.71%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.03%)
Rathlin Island SPA	822 (2021)	77	Breeding		0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	57,796 (2020/2021)	5,432	Breeding	63.70%	0.0 (0.0 to 0.7)	0.00% (0.00% to 0.01%)
			Non-breeding	3.47%	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Hermaness, Saxa Vord and Valla Field SPA	47,322 (2002)	4,448	Non-breeding	1.51%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Foula SPA	45,000 (2000)	4,230	Non-breeding	1.44%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Forth Islands SPA	124,462 (2008/2010)	11,699	Non-breeding	3.49%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Farne Islands SPA	79,924 (2013)	7,513	Non-breeding	2.24%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Sule Kerry and Sule Stack SPA	118,942 (1998)	11,181	Non-breeding	8.57%	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
St Kilda SPA	284,528 (2000)	26,746	Non-breeding	20.49%	0.0 (0.0 to 0.3)	0.00% (0.00% to 0.00%)
Shiant Isles SPA	130,340 (2000)	12,252	Non-breeding	9.39%	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Flannan Isles SPA	31,200 (2001)	2,933	Non-breeding	2.25%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)

1 Values represent 50% displacement and 1% mortality (30% displacement and 1% mortality – 70% displacement and 10% mortality)

1.4.1.3 As the predicted project alone impact is predicted to increase the baseline mortality by <0.05% under all scenarios assessed (30-70% displacement and 1-10% mortality) it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for all the SPAs considered (as set out in Figure 1.1 of HRA Stage 2 ISAA. Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)).

Black-legged kittiwake

1.4.1.4 As presented in Table 1.3, the breeding season impact for black-legged kittiwake was 4 (2 to 51), and the age-class apportioning was 95.36% of birds are adults (Table 1.4). During the spring migration season impact for black-legged kittiwake was 3 (2 to 40) birds and 3 (2 to 39) during the autumn migration season (Table 1.3). The age-class apportioning was 92.01% of birds are adults during both the spring and autumn migration seasons (Table 1.4). The baseline mortality for black-legged kittiwake is 0.146 (Table 1.6).

1.4.1.5 Sites which are predicted to be impacted by an increase of >0.05% and therefore require an in-combination assessment are highlighted in yellow within Table 1.8.

Table 1.8: Adult black-legged kittiwake mortality due to displacement apportioned to SPAs.

Site	Colony count (year)	Baseline Mortality (0.146)	Bio season	Apportioning Value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
Lambay Island SPA	6,640 (2015)	969	Breeding	3.78	0.1 (0.1 to 1.8)	0.01% (0.01% to 0.19%)	0.4	0.04%
Rathlin Island SPA	27,534 (2021)	4,020	Breeding	4.91	0.2 (0.1 to 2.4)	0.00% (0.00% to 0.06%)	0.5	0.01%
			Post-breeding	1.91	0.1 (0.0 to 0.7)	0.00% (0.00% to 0.03%)	0.1	0.01%
			Pre-breeding	3.37	0.1 (0.1 to 1.2)	0.00% (0.00% to 0.05%)	0.3	0.01%
Ireland's Eye SPA	3,100 (2015)	453	Breeding	1.59	0.1 (0.0 to 0.8)	0.01% (0.01% to 0.17%)	0.2	0.04%
Howth Head Coast SPA	3,586 (2015)	524	Breeding	1.84	0.1 (0.0 to 0.9)	0.01% (0.01% to 0.17%)	0.2	0.04%
Wicklow Head SPA	1,348 (2022)	197	Breeding	0.56	0.0 (0.0 to 0.3)	0.01% (0.01% to 0.14%)	0.1	0.03%
Helvick Head to Ballyquin SPA	130 (2018)	19	Breeding	0.01	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.03%)	0.0	0.01%
Saltee Islands SPA	1,690 (2013)	247	Breeding	0.22	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.04%)	0.0	0.01%
North Colonsay and Western Cliffs SPA	9,361 (2023)	1,367	Breeding	0.85	0.0 (0.0 to 0.4)	0.00% (0.00% to 0.03%)	0.1	0.01%
			Post-breeding	1.34	0.0 (0.0 to 0.5)	0.00% (0.00% to 0.03%)	0.1	0.01%

Site	Colony count (year)	Baseline Mortality (0.146)	Bio season	Apportioning Value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
			Pre-breeding	2.37	0.1 (0.0 to 0.9)	0.00% (0.00% to 0.05%)	0.2	0.01%
Ailsa Craig SPA	980 (2021)	143	Breeding	0.30	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.10%)	0.0	0.02%
			Post-breeding	0.12	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.03%)	0.0	0.01%
			Pre-breeding	0.21	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.05%)	0.0	0.01%
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	2,014 (2022)	294	Breeding	0.30	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.05%)	0.0	0.01%
			Post-breeding	0.25	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.03%)	0.0	0.01%
			Pre-breeding	0.45	0.0 (0.0 to 0.2)	0.00% (0.00% to 0.05%)	0.0	0.01%
North Caithness Cliffs SPA	20,300 (2000)	2,964	Post-breeding	0.81	0.0 (0.0 to 0.3)	0.00% (0.00% to 0.01%)	0.1	0.00%
			Pre-breeding	1.62	0.1 (0.0 to 0.6)	0.00% (0.00% to 0.02%)	0.1	0.00%
East Caithness Cliffs SPA	80,820 (1999)	11,800	Post-breeding	3.24	0.1 (0.1 to 1.2)	0.00% (0.00% to 0.01%)	0.2	0.00%
			Pre-breeding	6.45	0.2 (0.1 to 2.4)	0.00% (0.00% to 0.02%)	0.5	0.00%
Troup, Pennan and Lions Heads SPA	29,792 (2007)	4,350	Post-breeding	1.19	0.0 (0.0 to 0.4)	0.00% (0.00% to 0.01%)	0.1	0.00%
			Pre-breeding	2.38	0.1 (0.0 to 0.9)	0.00% (0.00% to 0.02%)	0.2	0.00%
Buchan Ness to Collieston SPA	25,084 (2007)	3,662	Post-breeding	1.01	0.0 (0.0 to 0.4)	0.00% (0.00% to 0.01%)	0.1	0.00%
			Pre-breeding	2.00	0.1 (0.0 to 0.7)	0.00% (0.00% to 0.02%)	0.2	0.00%
Fowlsheugh SPA	18,674 (2012)	2,726	Post-breeding	0.75	0.0 (0.0 to 0.3)	0.00% (0.00% to 0.01%)	0.1	0.00%
			Pre-breeding	1.49	0.1 (0.0 to 0.5)	0.00% (0.00% to 0.02%)	0.1	0.00%
Flamborough and Filey Coast SPA	75,234 (2008)	10,984	Post-breeding	3.02	0.1 (0.1 to 1.1)	0.00% (0.00% to 0.01%)	0.2	0.00%

Site	Colony count (year)	Baseline Mortality (0.146)	Bio season	Apportioning Value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
			Pre-breeding	6.01	0.2 (0.1 to 2.2)	0.00% (0.00% to 0.02%)	0.5	0.00%
Cape Wrath SPA	20,688 (2000)	3,020	Post-breeding	2.49	0.1 (0.0 to 0.9)	0.00% (0.00% to 0.03%)	0.2	0.01%
			Pre-breeding	4.40	0.1 (0.1 to 1.6)	0.00% (0.00% to 0.05%)	0.4	0.01%
West Westray SPA	24,110 (2007)	3,520	Post-breeding	1.93	0.1 (0.0 to 0.7)	0.00% (0.00% to 0.02%)	0.1	0.00%

1 Values represent 50% displacement and 1% mortality (30% displacement and 1% mortality – 70% displacement and 10% mortality)
2 Values represent 30% displacement and 3% mortality which is in line with NatureScot guidance on black-legged kittiwake displacement assessment (NatureScot, 2023)

1.4.1.6 As the project alone impact is predicted to increase the baseline mortality by <0.05% for all scenarios examined it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for several of the SPAs considered. However the predicted impact on Ailsa Craig SPA, Rathlin Island SPA, Lambay Island SPA, Ireland's Eye SPA, Howth Head Coast SPA, Wicklow Head SPA, Cape Wrath SPA, North Colonsay and Western Cliffs SPA and Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >0.05% (when considering the highest displacement (70%) and mortality rates (10%)) and therefore these sites are considered as part of the in-combination assessments (section 1.4.3). The Applicant has presented the combined impact from both displacement and collisions as part of the in-combination assessments (section 1.4.3). Within the in-combination tables, subsequent matrices and PVAs for each SPA considered, collision impacts are presented and assessed separately so that any relevant body that requires only an assessment of collisions can interpret the results.

Common guillemot

1.4.1.7 As presented in Table 1.3, the non-breeding season impact for common guillemot was 19 (11 to 263), and the age-class apportioning is 100% of birds are considered adults (Table 1.4). The baseline mortality for common guillemot is 0.061 (Table 1.6).

1.4.1.8 Within Table 1.9, the displacement impact is also considered using a 70% displacement rate and a 2% mortality rate alongside the SNCBs advised range, which is in line with recent HRAs undertaken by the Secretary of State for offshore wind projects within the North Sea (e.g. Hornsea Two/Three/Four, East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard, SEP and DEP).

1.4.1.9 Sites which are predicted to be impacted by an increase of >0.05% and therefore require an in-combination assessment are highlighted in yellow within Table 1.9.

Table 1.9: Adult common guillemot mortality due to displacement apportioned to SPAs during the non-breeding bioseason.

SPA	Colony Count (year)	Baseline mortality (0.061)	Apportioning value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted Impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
Sule Skerry and Sule Stack SPA	15,266 (1998)	931	2.21	0.4 (0.2 to 5.8)	0.045% (0.03% to 0.62%)	1.17	0.13%
North Rona and Sula Sgeir SPA	10,000 (1998)	610	1.45	0.3 (0.2 to 3.8)	0.045% (0.03% to 0.62%)	0.77	0.13%
Cape Wrath SPA	54,718 (2000)	3,338	7.92	1.5 (0.9 to 20.8)	0.045% (0.03% to 0.62%)	4.20	0.13%
Handa SPA	75,986 (1998)	4,635	11.00	2.1 (1.2 to 28.9)	0.045% (0.03% to 0.62%)	5.83	0.13%
Shiant Isles SPA	10,296 (1999)	628	1.49	0.3 (0.2 to 3.9)	0.045% (0.03% to 0.62%)	0.79	0.13%
Flannan Isles SPA	19,614 (1998)	1,196	2.84	0.5 (0.3 to 7.5)	0.045% (0.03% to 0.62%)	1.51	0.13%
St Kilda SPA	31,400 (1999)	1,915	4.55	0.9 (0.5 to 12.0)	0.045% (0.03% to 0.62%)	2.41	0.13%
Canna and Sanday SPA	7,826 (1999)	477	1.13	0.2 (0.1 to 3.0)	0.045% (0.03% to 0.62%)	0.60	0.13%
Mingulay and Berneray SPA	27,054 (2003)	1,650	3.92	0.7 (0.4 to 10.3)	0.045% (0.03% to 0.62%)	2.08	0.13%
North Colonsay and Western Cliffs SPA	27,000 (2000)	1,647	4.11	0.8 (0.5 to 10.8)	0.047% (0.03% to 0.66%)	2.18	0.13%
Ailsa Craig SPA	10,494 (2013)	640	1.60	0.3 (0.2 to 4.2)	0.047% (0.03% to 0.66%)	0.85	0.13%

SPA	Colony Count (year)	Baseline mortality (0.061)	Apportioning value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted Impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
Rathlin Island SPA	174,796 (2011)	10,663	26.64	5.1 (2.9 to 70.1)	0.047% (0.03% to 0.66%)	14.12	0.13%
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	32,600 (2013)	1,989	4.47	0.8 (0.5 to 11.8)	0.043% (0.02% to 0.59%)	2.37	0.12%

[1] Values represent 50% displacement and 1% mortality (30% displacement and 1% mortality – 70% displacement and 10% mortality)
[2] Values represent 70% displacement and 2% mortality

1.4.1.10 As the project alone impact is predicted to increase the baseline mortality by >0.05% under multiple scenarios assessed (70% displacement and 2-10% mortality), it is deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for all of the SPAs considered (section 1.4.3).

Northern gannet

1.4.1.11 As presented in Table 1.3, the breeding season impact for northern gannet was 2 (2 to 20), and the age-class apportioning was 93.58% of birds are adults (Table 1.4). During post-breeding season, the impact for northern gannet was 0 (0 to 2) birds and 0 (0 to 5) birds for the pre-breeding season (Table 1.3). The age-class apportioning was 96.43% of birds are adults during both the pre- and post-breeding seasons (Table 1.4). The baseline mortality for northern gannet is 0.081 (Table 1.6).

1.4.1.12 Sites which are predicted to be impacted by an increase of >0.05%, and therefore require an in-combination assessment, are highlighted in yellow within Table 1.10.

Table 1.10: Adult northern gannet mortality due to displacement apportioned to SPAs.

Site	Colony count (year)	Baseline Mortality (0.081)	Bio season	Apportioning Value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]
Ailsa Craig SPA	66,452 (2014)	5,383	Breeding	56.16	1.0 (1.0 to 10.5)	0.02% (0.02% to 0.19%)
			Post-breeding	17.06	0.0 (0.0 to 0.8)	0.00% (0.00% to 0.02%)
			Pre-breeding	13.86	0.0 (0.0 to 0.3)	0.00% (0.00% to 0.01%)
Grassholm SPA	72,022 (2015)	5,834	Breeding	17.61	0.3 (0.3 to 3.3)	0.01% (0.01% to 0.06%)
			Post-breeding migration	24.71	0.0 (0.0 to 1.2)	0.00% (0.00% to 0.02%)
			Pre-breeding	20.07	0.0 (0.0 to 0.4)	0.00% (0.00% to 0.01%)
Saltee Islands SPA	9,444 (2013)	765	Breeding	2.82	0.1 (0.1 to 0.5)	0.01% (0.01% to 0.07%)
Skelligs SPA	70,588 (2014)	5,718	Breeding	4.37	0.1 (0.1 to 0.8)	0.00% (0.00% to 0.01%)
St Kilda SPA	120,636 (2014)	9,772	Breeding	5.04	0.1 (0.1 to 0.9)	0.00% (0.00% to 0.01%)
			Post-breeding migration	33.75	0.0 (0.0 to 1.6)	0.00% (0.00% to 0.02%)
			Pre-breeding	30.46	0.0 (0.0 to 0.6)	0.00% (0.00% to 0.01%)
Hermaness, Saxa Vord and Valla Field SPA	48,706 (2008)	3,945	Post-breeding migration	3.06	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
			Pre-breeding	3.73	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Noss SPA	19,534 (2008)	1,582	Post-breeding migration	1.23	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
			Pre-breeding	1.50	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Sule Skerry and Sule Stack SPA	9,350 (2004)	757	Post-breeding migration	2.65	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.02%)
			Pre-breeding	2.39	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)
North Rona and Sula Sgeir SPA	18,450 (2004)	1,494	Post-breeding migration	5.22	0.0 (0.0 to 0.3)	0.00% (0.00% to 0.02%)
			Pre-breeding	4.71	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)

[1] Values represent 70% displacement and 1% mortality (60 % displacement and 1% mortality - 80% displacement and 10% mortality)

1.4.1.13 As the project alone impact is predicted to increase the baseline mortality by <0.05% for all scenario examined, it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for several of the SPAs considered. However, the predicted displacement impact on Ailsa Craig SPA, Grassholm SPA and Saltee Islands SPA is >0.05% (under the highest displacement rate of 80% and mortality rate of 10%), and therefore, these sites are considered as part of the in-combination assessments (section 1.4.3). The Applicant has presented the combined impact from both displacement and collisions as part of the in-combination assessments (section 1.4.3).

Manx shearwater

1.4.1.14 As presented in Table 1.3, the breeding season impact for Manx shearwater was 6 (4 to 87), and the age-class apportioning was 100% of birds are adults (Table 1.4). During pre-breeding season, the impact for Manx shearwater was 0 (0 to 0) birds, and 0 (0 to 1) birds for the post-breeding season (Table 1.3). The age-class apportioning assumes 100% of birds are adults during both the pre- and post-breeding seasons (Table 1.4). The baseline mortality for Manx shearwater is 0.130 (Table 1.6).

1.4.1.15 Sites which are predicted to be impacted by an increase of >0.05% and therefore require an in-combination assessment are highlighted in yellow within Table 1.11.

Table 1.11. Adult Manx shearwater mortality due to displacement apportioned to SPAs.

Site	Colony count (year)	Baseline Mortality (0.130)	Bio season	Apportioning Value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]
Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA	32,366 (2001)	4,208	Breeding	11.34	0.7 (0.5 to 9.9)	0.02% (0.01% to 0.23%)
			Post-breeding	3.26	0.0 (0.0 to 0.4)	0.00% (0.00% to 0.01%)
Copeland Islands SPA	9,700 (2007)	1,261	Breeding	2.20	0.1 (0.1 to 1.9)	0.01% (0.01% to 0.15%)
Cruagh Island SPA	6,572 (2001)	854	Breeding	0.17	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.02%)
Blasket Islands SPA	39,068 (2001)	5,079	Breeding	0.75	0.0 (0.0 to 0.7)	0.00% (0.00% to 0.01%)
Skelligs SPA	1,476 (2001)	192	Breeding	0.03	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)
Deenish Island and Scariff Island SPA	4,622 (2000)	601	Breeding	0.09	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
Rum SPA	240,000 (2001)	31,200	Breeding	7.01	0.4 (0.3 to 6.1)	0.00% (0.00% to 0.02%)
			Pre-breeding	24.19	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Post-breeding	24.19	0.0 (0.2 to 3.1)	0.00% (0.00% to 0.01%)
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	910,312 (2018)	118,341	Breeding	74.975	4.5 (3.0 to 65.2)	0.00% (0.00% to 0.06%)
			Pre-breeding	70.54	0,0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Post-breeding	70.54	0.0 (0.7 to 9.2)	0.00% (0.00% to 0.01%)
St Kilda SPA	9,604 (1999)	1,249	Pre-breeding	0.97	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Post-breeding	0.97	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)

1 Values represent 50% displacement and 1% mortality (30% displacement and 1% mortality – 70% displacement and 10% mortality)

1.4.1.16 As the project alone impact is predicted to increase the baseline mortality by <0.05% in all scenarios examined, it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for several of the SPAs considered. However, the predicted impact on Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA, Copeland Islands SPA and Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >0.05% (under the highest displacement rate of 70% and mortality rate of 10%) and therefore these sites are considered as part of the in-combination assessments (section 1.4.3).

Razorbill

1.4.1.17 As presented in Table 1.3, the migration season impact for razorbill was 10 (6 to 141) and 2 (1 to 29) during the winter. The age-class apportioning is 100% of birds are considered adults (Table 1.4). The baseline mortality for razorbill is 0.105 (Table 1.6).

1.4.1.18 Within Table 1.12, the displacement impact is also considered using a 70% displacement rate and a 2% mortality rate alongside the SNCBs advised range, which is in line with recent HRAs undertaken by the Secretary of State for offshore wind projects within the North Sea (e.g Hornsea Three/Four, SEP and DEP).

1.4.1.19 Sites which are predicted to be impacted by an increase of >0.05% and therefore require an in-combination assessment are highlighted in yellow within Table 1.12.

Table 1.12: Adult non-breeding razorbill mortality due to displacement apportioned to SPAs.

SPA	Colony count (year)	Baseline Mortality (0.105)	Bio season	Apportioning value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted Impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
Cape Wrath SPA	4,180 (2000)	439	Migration seasons	1.29%	0.1 (0.1 to 1.8)	0.03% (0.02% to 0.42%)	0.18	0.04%
			Winter	0.93%	0.0 (0.0 to 0.3)	0.00% (0.00% to 0.06%)	0.13	0.03%
Handa SPA	10,330 (2010)	1,085	Migration seasons	3.19%	0.3 (0.2 to 4.5)	0.03% (0.02% to 0.42%)	0.45	0.04%
			Winter	2.31%	0.0 (0.0 to 0.7)	0.00% (0.00% to 0.06%)	0.32	0.03%
Shiant Isles SPA	8,496 (2008)	892	Migration seasons	2.63%	0.3 (0.2 to 3.7)	0.03% (0.02% to 0.42%)	0.37	0.04%
			Winter	1.90%	0.0 (0.0 to 0.5)	0.00% (0.00% to 0.06%)	0.27	0.03%
Mingulay and Berneray SPA	20,222 (2009)	2,123	Migration seasons	6.25	0.6 (0.4 to 8.8)	0.03% (0.02% to 0.42%)	0.88	0.04%
			Winter	4.51%	0.1 (0.0 to 1.3)	0.00% (0.00% to 0.06%)	0.63	0.03%
Rathlin Island SPA	30,786 (2011)	3,233	Migration seasons	9.52%	1.0 (0.6 to 13.4)	0.03% (0.02% to 0.42%)	1.33	0.04%
			Winter	6.87%	0.1 (0.1 to 2.0)	0.00% (0.00% to 0.06%)	0.96	0.03%
Skomer, Skokholm and the Seas off	12,002 (2013)	1,260	Migration seasons	3.71%	0.4 (0.2 to 5.2)	0.03% (0.02% to 0.42%)	0.52	0.04%

SPA	Colony count (year)	Baseline Mortality (0.105)	Bio season	Apportioning value (%)	Predicted Impact (adult bird mortalities)[1]	Increase in baseline mortality[1]	Predicted Impact (adult bird mortalities)[2]	Increase in baseline mortality[2]
Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA			Winter	2.01%	0.0 (0.0 to 0.6)	0.00% (0.00% to 0.05%)	0.28	0.02%
Flannan Isles SPA	2,102 (1998)	221	Migration seasons	0.65%	0.1 (0.0 to 0.9)	0.03% (0.02% to 0.42%)	0.09	0.04%
			Winter	0.47%	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.06%)	0.09	0.03%

[1] Values represent 50% displacement and 1% mortality (30% displacement and 1% mortality – 70% displacement and 10% mortality)
[2] Values represent 70% displacement and 2% mortality

1.4.1.20 As the project alone impact is predicted to increase the baseline mortality by >0.05% under the highest displacement rate of 70% and mortality rate of 10% it is deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for all of the SPAs considered (section 1.4.3).

1.4.2 Apportioned collision impacts from the Mona Offshore Wind Project alone

1.4.2.1 The bioseasons included within following tables replicate the tables presented in Appendix A of the HRA Stage 1 Screening (Document Reference E1.4 F03). Some sites do not have non-breeding season impacts apportioned as they represent less than 1% of the relevant BDMPS and were screened out of assessment during those periods (in line with SCNB advice during the EWG (see Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01)). However, within the in-combination tables (section 1.4.3) the complete annual impact is presented (including non-breeding impacts even when a site is <1% of the BDMPS).

Black-legged kittiwake

1.4.2.2 As presented in Table 1.3 the breeding season impact for black-legged kittiwake was 15.52 (5.68 to 31.60) when using the species-group avoidance rate and the age-class apportioning was 95.36% of birds are adults (Table 1.4). During the spring migration season impact for black-legged kittiwake was 8.74 (3.09 to 18.15) birds and 8.41 (2.96 to 17.53) during the autumn migration season (Table 1.3). The age-class apportioning was 92.01% of birds are adults during both the spring and autumn migration seasons (Table 1.4).

1.4.2.3 Sites which are predicted to be impacted by an increase of >0.05% and therefore require an in-combination assessment are highlighted in yellow within Table 1.13.

Table 1.13: Adult black-legged kittiwake apportioned expected SPA mortality due to collision using species-group avoidance rate (0.9928).

Site	Colony count	Baseline Mortality (0.146)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts	Increase in baseline mortality mean (LCI and UCI) (%)
Lambay Island SPA	6,640 (2015)	969	Breeding	3.78	0.6 (0.2 to 1.1)	0.06% (0.02% to 0.12%)
Rathlin Island SPA	27,534 (2021)	4,020	Breeding	4.91	0.0 (0.0 to 0.0)	0.01% (0.00% to 0.02%)
			Post-breeding	1.91	0.1 (0.1 to 0.3)	0.01% (0.00% to 0.01%)
			Pre-breeding	3.37	0.3 (0.1 to 0.6)	0.01% (0.00% to 0.02%)
Ireland's Eye SPA	3,100 (2015)	453	Breeding	1.59	0.2 (0.1 to 0.5)	0.05% (0.02% to 0.11%)
Howth Head Coast SPA	3,586 (2015)	524	Breeding	1.84	0.3 (0.1 to 0.6)	0.05% (0.02% to 0.11%)
Wicklow Head SPA	1,348 (2022)	197	Breeding	0.56	0.1 (0.0 to 0.2)	0.04% (0.02% to 0.09%)
Helvick Head to Ballyquin SPA	130 (2018)	19	Breeding	0.01	0.0 (0.0 to 0.0)	0.01% (0.00% to 0.02%)
Saltee Islands SPA	1,690 (2013)	247	Breeding	0.22	0.0 (0.0 to 0.1)	0.01% (0.00% to 0.03%)
	9,361 (2023)	1,367	Breeding	0.85	0.1 (0.0 to 0.3)	0.01% (0.00% to 0.02%)

Site	Colony count	Baseline Mortality (0.146)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts	Increase in baseline mortality mean (LCI and UCI) (%)
North Colonsay and Western Cliffs SPA			Post-breeding	1.34	0.1 (0.0 to 0.2)	0.01% (0.00% to 0.01%)
			Pre-breeding	2.37	0.2 (0.1 to 0.4)	0.01% (0.00% to 0.02%)
Ailsa Craig SPA	980 (2021)	143	Breeding	0.30	0.0 (0.0 to 0.1)	0.03% (0.01% to 0.06%)
			Post-breeding	0.12	0.0 (0.0 to 0.0)	0.01% (0.00% to 0.01%)
			Pre-breeding	0.21	0.0 (0.0 to 0.0)	0.01% (0.00% to 0.02%)
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	2,014 (2022)	294	Breeding	0.30	0.0 (0.0 to 0.1)	0.02% (0.01% to 0.03%)
			Post-breeding	0.25	0.0 (0.0 to 0.0)	0.01% (0.00% to 0.01%)
			Pre-breeding	0.45	0.0 (0.0 to 0.1)	0.01% (0.00% to 0.02%)
North Caithness Cliffs SPA	20,300 (2000)	2,964	Post-breeding	0.81	0.1 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
			Pre-breeding	1.62	0.1 (0.0 to 0.3)	0.00% (0.00% to 0.01%)
East Caithness Cliffs SPA	80,820 (1999)	11,800	Post-breeding	3.24	0.3 (0.1 to 0.5)	0.00% (0.00% to 0.00%)
			Pre-breeding	6.45	0.5 (0.2 to 1.1)	0.00% (0.00% to 0.01%)
Troup, Pennan and Lions Heads SPA	29,792 (2007)	4,350	Post-breeding	1.19	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.00%)
			Pre-breeding	2.38	0.2 (0.1 to 0.4)	0.00% (0.00% to 0.01%)
Buchan Ness to Collieston SPA	25,084 (2007)	3,662	Post-breeding	1.01	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.00%)
			Pre-breeding	2.00	0.2 (0.1 to 0.3)	0.00% (0.00% to 0.01%)
Fowlsheugh SPA	18,674 (2012)	2,726	Post-breeding	0.75	0.1 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
			Pre-breeding	1.49	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.01%)
Flamborough and Filey Coast SPA	75,234 (2008)	10,984	Post-breeding	3.02	0.2 (0.1 to 0.5)	0.00% (0.00% to 0.00%)
			Pre-breeding	6.01	0.5 (0.2 to 1.0)	0.00% (0.00% to 0.01%)
Cape Wrath SPA	20,688 (2000)	3,020	Post-breeding	2.49	0.2 (0.1 to 0.4)	0.01% (0.00% to 0.01%)
			Pre-breeding	4.40	0.4 (0.1 to 0.7)	0.01% (0.00% to 0.02%)
West Westray SPA	24,110 (2007)	3,520	Pre-breeding	1.93	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.00%)

1.4.2.4 As the project alone impact is predicted to increase the baseline mortality by <0.05%, it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for several of the SPAs considered. However the predicted impact on Ailsa Craig SPA, Rathlin Island SPA, Lambay Island SPA, Ireland's Eye SPA, Howth Head Coast SPA, Wicklow Head SPA, Cape Wrath SPA, North Colonsay and Western Cliffs SPA and Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >0.05% when considering the UCI and therefore these sites are considered as part of the in-combination assessments (section 1.4.3).The Applicant has presented the combined impact from both displacement and collisions as part of the

in-combination assessments (section 1.4.3). Within the in-combination tables, subsequent matrices and PVAs for each SPA considered, collision impacts are presented and assessed separately so that any relevant body that requires only an assessment of collisions can interpret the results.

Herring gull

1.4.2.5 As presented in Table 1.3 the breeding season impact for herring gull was 0.03 (0.01 to 0.06), and the age-class apportioning was 80.0% of birds are adults (Table 1.4). During the non-breeding season impact on herring gull was 1.48 (0.50 to 3.13) birds (Table 1.3) and the age-class apportioning was 75.61% of birds are adults (Table 1.4).

1.4.2.6 Species-group and species-specific avoidance rates for herring gull are 0.9939 and 0.9952, respectively.

Table 1.14: Adult herring gull apportioned expected SPA mortality due to collision.

Site	Colony count	Baseline Mortality (0.171)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts using species-group avoidance	Increase in baseline mortality (%) using species-group avoidance	Mean (LCI and UCI) of collision impacts using species-specific avoidance rates	Increase in baseline mortality (%) using species-specific avoidance rates
Morecambe Bay SPA	3,188 (2023)	529	Breeding	18.80%	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Non-breeding	3.18%	0.0 (0.0 to 0.1)	0.00% to 0.01%	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)

1.4.2.7 As the predicted project alone impact is predicted to increase the baseline mortality by <0.05%, it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for the Morecambe Bay SPA (as set out in Figure 1.1 of HRA Stage 2 ISAA. Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)).

Great black-backed gull

1.4.2.8 As presented in Table 1.3 , the non-breeding season impact for great black-backed gull was 3.16 (1.07 to 6.66) and the age-class apportioning was 70.49% of birds are adults (Table 1.4). Species-group and species-specific avoidance rates are presented in Table 1.15. Note that this species typically takes 5 years to be defined as an identifiable 'adult' in the field.

1.4.2.9 The impact from the project alone is predicted to increase the baseline mortality by >1% when considering the UCI of collision impacts. No project alone PVA was undertaken because the predicted number of collisions is small (1.4 birds) when considering the UCI and the species-group avoidance rate. Furthermore, the increase in baseline mortality is only marginally above the 1.00% threshold and the Applicant used expert judgement to determine whether PVA was required to aid with the ability to conclude an AEoSI or not.

1.4.2.10 Species-group and species-specific avoidance rates for great black-backed gull are 0.9939 and 0.9991, respectively.

1.4.2.11 Sites which are predicted to be impacted by an increase in baseline mortality of >0.05% and, therefore require an in-combination assessment are highlighted in yellow within Table 1.15. The in-combination assessment of great black-backed gull from the Isle of Scilly SPA is presented within section 1.5.4 of HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). As the Applicant has present the assessment of collisions in-line with SNCBs advice within the main ISAA document (HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)), it has not been repeated within this Annex. Therefore, great black-backed gull is not considered any further within this Annex.

Table 1.15. Adult great black-backed gull apportioned expected SPA mortality due to collision during the non-breeding bioseason.

Site	Colony count	Baseline Mortality (0.070)	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts using species-group avoidance rates	Increase in baseline mortality (%) using species-group avoidance rates	Mean (LCI and UCI) of collision impacts using species-specific avoidance rates	Increase in baseline mortality (%) using species-specific avoidance rates
Isles of Scilly SPA	1,802 (2006)	126	28.85	0.6 (0.2 to 1.4)	0.51% (0.18% to 1.08%)	0.1 (0.0 to 0.2)	0.08% (0.03% to 0.16%)

1.4.2.12 As the alone impact is predicted to increase the baseline mortality by >0.05% when considering either avoidance rate, it is deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for the Isles of Scilly SPA (as set out in Figure 1.1 of HRA Stage 2 ISAA. Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)). The in-combination assessment of great black-backed gull from the Isle of Scilly SPA is presented within section 1.5.4 of HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).

Lesser black-backed gull

1.4.2.13 As presented in Table 1.3, the breeding season impact for lesser black-backed gull was 0.33 (0.10 to 0.81), and the age-class apportioning was 81.82% of birds are adults (Table 1.4). During the pre-breeding season impact for lesser black-backed gull was 0.83 (0.26 to 1.94) birds, and 0.76 (0.23 to 1.69) during the winter season (Table 1.4). The age-class apportioning was 86.96% of birds are adults during both the spring migration and winter seasons (Table 1.4).

1.4.2.14 Species-group and species-specific avoidance rates or lesser black-backed gull are 0.9939 and 0.9954, respectively.

Table 1.16. Adult lesser black-backed gull apportioned expected SPA mortality due to collision.

Site	Colony count	Baseline Mortality (0.121)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts using species-group avoidance rates	Increase in baseline mortality (%) using species-group avoidance rates	Mean (LCI and UCI) of collision impacts using species-specific avoidance rates	Increase in baseline mortality (%) using species-specific avoidance rates
Ribble and Alt Estuaries SPA	8,978 (2021)	1,032	Breeding	26.78	0.1 (0.0 to 0.2)	0.01% (0.00% to 0.02%)	0.1 (0.0 to 0.1)	0.01% (0.00% to 0.01%)
			Post-breeding	7.30	No predicted collisions			
			Winter	9.18	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
			Pre-breeding	7.47	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Morecambe Bay and Duddon Estuary SPA	4,874 (2023)	561	Breeding	12.72	0.0 (0.0 to 0.1)	0.01% (0.00% to 0.02%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
			Post-breeding	4.41	No predicted collisions			
			Winter	5.54	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
			Pre-breeding	4.50	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Bowland Fells	29,254 (2012)	3,364	Breeding	37.21	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.01%)	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.01%)

Site	Colony count	Baseline Mortality (0.121)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts using species-group avoidance rates	Increase in baseline mortality (%) using species-group avoidance rates	Mean (LCI and UCI) of collision impacts using species-specific avoidance rates	Increase in baseline mortality (%) using species-specific avoidance rates
			Post-breeding	4.04	No predicted collisions			
			Winter	5.08	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
			Pre-breeding	4.13	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Lambay Island SPA	952 (2010)	109	Breeding	0.49	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Ailsa Craig SPA	378 (2019)	43	Breeding	0.10	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Rathlin Island SPA	1,038 (2021)	119	Breeding	0.16	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Post-breeding	0.09	No predicted collisions			
			Winter	0.12	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)
			Pre-breeding	0.10	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	16,214 (2023)	1,865	Breeding	1.95	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Post-breeding	11.92	No predicted collisions			
			Winter	10.70	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.01%)	0.1 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
			Pre-breeding	12.19	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.01%)	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.01%)
Isles of Scilly SPA	6,800 (2006)	782	Post-breeding	5.41	No predicted collisions			
			Winter	3.77	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
			Pre-breeding	5.53	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)

1.4.2.15 As the project alone impact is predicted to increase the baseline mortality by <0.05% for all the scenarios considered, it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for all the SPAs considered (as set out in Figure 1.1 of HRA Stage 2 ISAA. Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03)).

Manx shearwater

1.4.2.16 There were no predicted collisions for Manx shearwater throughout the entire year and so no apportioning table is presented.

Northern fulmar

1.4.2.17 Within Table 1.3, the impact on northern fulmar was 0.32 (0.00 to 1.94) birds (when considering the LCI and UCI of the collision impacts) during the breeding season. It is not deemed necessary to undertake a full apportioning for this species for the 10 SPAs identified within the HRA Stage 1 Screening Report (Document Reference E1.4 F03). Northern fulmar has an extensive foraging range, and therefore, a large number of SPAs could be included.

1.4.2.18 Using the apportioning values from Morgan Offshore Wind Farm: Generation Assets as a proxy (Morgan Generation Assets, 2024), the St Kilda SPA represented the largest apportioned value during the breeding season (1.0%). The latest population of St Kilda SPA is 58,372 adult birds, and the baseline mortality is 3,736 (using a baseline mortality of 0.064, Horswill and Robinson, 2014). Therefore, the added mortality of up to 0.02 birds (1.94 multiplied by 1.0%) represents a 0.005% increase in baseline mortality. Given the minute numbers involved, a full apportioning is not considered by the Applicant to be proportionate to the potential risk.

Northern gannet

1.4.2.19 As presented in Table 1.3, the breeding season impact for northern gannet was 1.42 (0.28 to 3.94) (when considering 70% macro-avoidance), and the age-class apportioning was 93.58% of birds are adults (Table 1.4). During post-breeding migration season, the impact for northern gannet was 0.15 (0.03 to 0.39) birds and 0.13 (0.04 to 0.33) birds for the return migration season when considering 70% macro-avoidance (Table 1.3). The age-class apportioning was 96.43% of birds are adults during both the post-breeding and return migration seasons (Table 1.4). The baseline mortality for northern gannet is 0.081 (Table 1.6).

1.4.2.20 Only species-group avoidance rate (0.9928) is presented in Table 1.17 as using the species-group avoidance rate is advised by the SNCBs.

Table 1.17: Adult northern gannet apportioned expected SPA mortality due to collision using species-group avoidance rate.

Site	Colony count (year)	Baseline Mortality (0.081)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts	Increase in baseline mortality (%)
Ailsa Craig SPA	66,452 (2014)	5,383	Breeding	56.16	0.7 (0.1 to 2.1)	0.01% (0.00% to 0.04%)
			Post-breeding migration	17.06	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
			Pre-breeding migration	13.86	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Grassholm SPA	72,022 (2015)	5,834	Breeding	17.61	0.2 (0.0 to 0.6)	0.00% (0.00% to 0.01%)
			Post-breeding migration	24.71	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)

Site	Colony count (year)	Baseline Mortality (0.081)	Bio season	Apportioning Value (%)	Mean (LCI and UCI) of collision impacts	Increase in baseline mortality (%)
			Pre-breeding migration	20.07	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Saltee Islands SPA	9,444 (2013)	765	Breeding	2.82	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.01%)
Skelligs SPA	70,588 (2014)	5,718	Breeding	4.37	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.00%)
St Kilda SPA	120,636 (2014)	9,772	Breeding	5.04	0.1 (0.0 to 0.2)	0.00% (0.00% to 0.00%)
			Post-breeding migration	33.75	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
			Pre-breeding migration	30.46	0.0 (0.0 to 0.1)	0.00% (0.00% to 0.00%)
Hermaness, Saxa Vord and Valla Field SPA	48,706 (2008)	3,945	Post-breeding migration	3.06	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Pre-breeding migration	3.73	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Noss SPA	19,534 (2008)	1,582	Post-breeding migration	1.23	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Pre-breeding migration	1.50	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
Sule Skerry and Sule Stack SPA	9,350 (2004)	757	Post-breeding migration	2.65	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Pre-breeding migration	2.39	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
North Rona and Sula Sgeir SPA	18,450 (2004)	1,494	Post-breeding migration	5.22	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)
			Pre-breeding migration	4.71	0.0 (0.0 to 0.0)	0.00% (0.00% to 0.00%)

1.4.2.21 As the project alone collision impact is predicted to increase the baseline mortality by <0.05% it is not deemed necessary to consider the Mona Offshore Wind Project within the in-combination assessment for all of the SPAs considered. However, the predicted combined displacement and collision impact on Ailsa Craig SPA, Grassholm SPA and Saltee Islands SPA is >0.05% (when considering the highest displacement and mortality rates) and therefore these sites are considered as part of the in-combination assessments (section 1.4.3). The Applicant has presented the combined impact from both displacement and collisions as part of the in-combination assessments (section 1.4.3).

1.4.3 In-combination assessments

1.4.3.1 As requested by the SNCBs and following the Applicant's criteria (see Figure 1.1 of HRA Stage 2 ISAA. Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) for inclusion of a SPA and qualifying feature to be taken through to in-combination assessment, the following sites are considered below. The approach to the screening out of in-combination assessments was deemed appropriate by NRW as part of their Relevant Representation for the Mona Offshore Wind Project. The threshold for inclusion within an in-combination assessment was if the Mona Offshore Wind Project alone impacted the designated site by a >0.05% increase in baseline mortality. An increase of <0.05% was considered non-material and within natural fluctuations of the population. The following species and SPAs require an in-combination assessment when considering the SNCB's advised range of impact scenarios:

- Black-legged kittiwake annually from:
  - Ailsa Craig SPA
  - Rathlin Island SPA
  - Lambay Island SPA
  - Ireland's Eye SPA
  - Howth Head Coast SPA
  - Wicklow Head SPA
  - Cape Wrath SPA
  - North Colonsay and Western Cliffs SPA
  - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
- Common guillemot during the non-breeding season from:
  - Sule Skerry and Sule Stack SPA
  - North Rona and Sula Sgeir SPA
  - Cape Wrath SPA
  - Handa SPA
  - Shiant Isles SPA
  - Flannan Isles SPA
  - St Kilda SPA
  - Canna and Sanday SPA
  - Mingulay and Berneray SPA
  - North Colonsay and western cliffs SPA
  - Ailsa Craig SPA
  - Rathlin Island SPA
  - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
- Northern gannet annually from:

  - Ailsa Craig SPA
  - Grassholm SPA
  - Saltee Islands SPA
- Manx shearwater annually from:
  - Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA
  - Copeland Islands SPA
  - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
- Razorbill annually from:
  - Cape Wrath SPA
  - Handa SPA
  - Shiant Isles SPA
  - Mingulay and Berneray SPA
  - Rathlin Island SPA
  - Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA
  - Flannan Isles SPA

1.4.3.2 As previously stated, the in-combination assessment for great black-backed gull from the Isles of Scilly SPA is presented in HRA Stage 2 ISAA. Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and not repeated here.

1.4.3.3 Following the method set out in section 1.3 the Applicant has used the proportion of adult/immature birds within the Appendix tables of Furness (2015) for undertaking the age-class apportioning for all projects considered in-combination, including the Mona Offshore Wind Project during the non-breeding season. During the breeding season, site-specific data has been used, and when no data is available that 100% of birds are considered adults.

Black-legged kittiwake

Ailsa Craig SPA

1.4.3.4 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Alisa Craig SPA, an in-combination assessment is presented within Table 1.18 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.18: In-combination assessment for black-legged kittiwake from the Ailsa Craig SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.002.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.001.

e – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)[e]			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.0021	0.001 [b]	0.0012	0.00 to 0.02	0.00 to 0.01	0.00 to 0.00	0.02	0.01	0.01	0.02 to 0.04	0.01 to 0.02	0.01 to 0.01	0.04 to 0.07
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0021	0.002 [c]	0.0012	0.00 to 0.00	0.00 to 0.10	0.00 to 0.00	0.00	0.05	0.00	0.00 to 0.00	0.05 to 0.15	0.00 to 0.00	0.05 to 0.15
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.0021	No connectivity	0.0012	0.01 to 0.16	-	0.00 to 0.02	0.01	-	0.02	0.02 to 0.18	-	0.02 to 0.04	0.04 to 0.22
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	112	68	1,064	1.17	0.88	11.60	0.0021	No connectivity	0.0012	0.00 to 0.02	-	0.00 to 0.09	0.00	-	0.01	0.00 to 0.02		0.02 to 0.10	0.02 to 0.12
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0021	No connectivity	0.0012	0.00 to 0.00	-	0.00 to 0.01	0.00	-	0.00	0.00 to 0.00	-	0.00 to 0.01	0.00 to 0.01
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.0021	0.001 [b]	0.0012	0.00 to 0.05	0.00 to 0.05	0.00 to 0.03	0.01	0.01	0.01	0.01 to 0.06	0.02 to 0.06	0.01 to 0.03	0.04 to 0.15
Morecambe Offshore Windfarm Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0021	0.003 [b]	0.0012	0.00 to 0.01	0.02 to 0.35	0.00 to 0.08	0.00	0.05	0.01	0.00 to 0.01	0.06 to 0.40	0.01 to 0.08	0.07 to 0.49
Morgan Offshore Wind Project Generation Assets	430	425	630	2.88	13.79	10.02	0.0021	0.002 [b]	0.0012	0.00 to 0.06	0.00 to 0.06	0.00 to 0.05	0.01	0.03	0.01	0.01 to 0.07	0.03 to 0.09	0.01 to 0.06	0.05 to 0.22
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0021	0.002 [c]	0.0012	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.0021	No connectivity	0.0012	0.00 to 0.07	-	0.00 to 0.01	0.05	-	0.01	0.05 to 0.11	-	0.01 to 0.02	0.06 to 0.13

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)[e]			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.0021	No connectivity	0.0012	0.00 to 0.02	-	0.00 to 0.00	0.02	-	0.01	0.02 to 0.04	-	0.01 to 0.01	0.03 to 0.05
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.0021	0.002 [c]	0.0012	0.01 to 0.12	0.00 to 0.04	0.00 to 0.05	0.02	0.04	0.06	0.02 to 0.13	0.04 to 0.08	0.06 to 0.11	0.12 to 0.32
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.0021	No connectivity	0.0012	0.00 to 0.10	-	0.00 to 0.04	0.02	-	0.01	0.03 to 0.12	-	0.01 to 0.05	0.04 to 0.17
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.0021	No connectivity	0.0012	0.00 to 0.06	-	0.00 to 0.01	0.01	-	0.00	0.01 to 0.07	-	0.00 to 0.01	0.01 to 0.08
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0021	0.002 [c]	0.0012	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.01
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0021	0.001 [d]	0.0012	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0021	0.001 [d]	0.0012	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.00 to 0.02
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0021	0.001 [d]	0.0012	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0021	0.002 [c]	0.0012	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0021	0.001 [d]	0.0012	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0021	0.002 [c]	0.0012	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.01 to 0.02
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.0021	0.002 [c]	0.0012	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0021	0.002 [c]	0.0012	0.00 to 0.01	0.00 to 0.06	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.04	0.00 to 0.01	0.01 to 0.05
Total predicted impact (adult birds)										**0.03 to 0.71**	**0.03 to 0.70**	**0.02 to 0.41**	**0.18**	**0.22**	**0.15**	**0.21 to 0.89**	**0.25 to 0.92**	**0.16 to 0.57**	**0.63 to 2.38**
Increase in baseline mortality (%)										**0.02% to 0.50%**	**0.02% to 0.49%**	**0.01% to 0.29%**	**0.13%**	**0.15%**	**0.11%**	**0.15% to 0.63%**	**0.17% to 0.64%**	**0.12% to 0.39%**	**0.44% to 1.66%**

1.4.3.5 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Ailsa Craig SPA, one (Table 1.19) showing the number of adult birds impacted at a variety of displacement and mortality rates (-100%) and one (Table 1.20) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cell represents the Applicant's approach,

used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (Document Reference F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.19: Matrix table showing the number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Ailsa Craig SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	1%	0.55	0.56	0.56	0.56	0.56	0.57	0.58	0.62	0.68	0.75	0.81
	5%	0.55	0.57	0.58	0.59	0.60	0.62	0.68	0.88	1.20	1.53	1.86
	10%	0.55	0.58	0.60	0.63	0.66	0.68	0.81	1.20	1.86	2.51	3.16
	20%	0.55	0.60	0.66	0.71	0.76	0.81	1.07	1.86	3.16	4.47	5.77
	30%	0.55	0.63	0.71	0.79	0.87	0.94	1.34	2.51	4.47	6.42	8.38
	40%	0.55	0.66	0.76	0.87	0.97	1.07	1.60	3.16	5.77	8.38	10.99
	50%	0.55	0.68	0.81	0.94	1.07	1.20	1.86	3.81	7.08	10.34	13.60
	60%	0.55	0.71	0.87	1.02	1.18	1.34	2.12	4.47	8.38	12.30	16.21
	70%	0.55	0.74	0.92	1.10	1.28	1.47	2.38	5.12	9.69	14.25	18.82
	80%	0.55	0.76	0.97	1.18	1.39	1.60	2.64	5.77	10.99	16.21	21.43
	90%	0.55	0.79	1.02	1.26	1.49	1.73	2.90	6.42	12.30	18.17	24.04
	100%	0.55	0.81	1.07	1.34	1.60	1.86	3.16	7.08	13.60	20.13	26.65

Table 1.20: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Ailsa Craig SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	0.38%	0.38%	0.38%	0.38%	0.38%	0.38%	0.38%	0.38%	0.38%	0.38%	0.38%
	1%	0.38%	0.39%	0.39%	0.39%	0.39%	0.40%	0.40%	0.43%	0.48%	0.52%	0.57%
	5%	0.38%	0.40%	0.40%	0.41%	0.42%	0.43%	0.48%	0.61%	0.84%	1.07%	1.30%
	10%	0.38%	0.40%	0.42%	0.44%	0.46%	0.48%	0.57%	0.84%	1.30%	1.76%	2.21%
	20%	0.38%	0.42%	0.46%	0.50%	0.53%	0.57%	0.75%	1.30%	2.21%	3.12%	4.04%
	30%	0.38%	0.44%	0.50%	0.55%	0.61%	0.66%	0.93%	1.76%	3.12%	4.49%	5.86%
	40%	0.38%	0.46%	0.53%	0.61%	0.68%	0.75%	1.12%	2.21%	4.04%	5.86%	7.69%
	50%	0.38%	0.48%	0.57%	0.66%	0.75%	0.84%	1.30%	2.67%	4.95%	7.23%	9.51%
	60%	0.38%	0.50%	0.61%	0.71%	0.82%	0.93%	1.48%	3.12%	5.86%	8.60%	11.34%
	70%	0.38%	0.51%	0.64%	0.77%	0.90%	1.03%	1.66%	3.58%	6.77%	9.97%	13.16%
	80%	0.38%	0.53%	0.68%	0.82%	0.97%	1.12%	1.85%	4.04%	7.69%	11.34%	14.99%
	90%	0.38%	0.55%	0.71%	0.88%	1.04%	1.21%	2.03%	4.49%	8.60%	12.71%	16.81%
	100%	0.38%	0.57%	0.75%	0.93%	1.12%	1.30%	2.21%	4.95%	9.51%	14.07%	18.64%

Rathlin Island SPA

1.4.3.6 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Rathlin Island SPA, an in-combination assessment is presented within Table 1.21

1.4.3.7 Table 1.21 (30-70% displacement and 1-10% mortality plus collisions).

Table 1.21: In-combination assessment for black-legged kittiwake from the Rathlin Island SPA – when considering 30-70% displacement and 1-10% mortality).

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation.

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.04.

d – the apportioning value during the breeding season has used that of Mona Offshore Wind Project, specifically 0.02.

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.0337	0.02 [d]	0.0191	0.02 to 0.38	0.01 to 0.12	0.00 to 0.06	0.28	0.23	0.09	0.30 to 0.66	0.24 to 0.36	0.09 to 0.15	0.62 to 1.16
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0337	0.02 [d]	0.0191	0.00 to 0.06	0.04 to 0.99	0.00 to 0.03	0.00	0.46	0.00	0.00 to 0.06	0.50 to 1.45	0.00 to 0.03	0.51 to 1.55
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.0337	No connectivity	0.0191	0.11 to 2.59	-	0.02 to 0.37	0.23	-	0.26	0.34 to 2.82	-	0.27 to 0.63	0.61 to 3.45
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.0337	No connectivity	0.0191	0.01 to 0.26	-	0.06 to 1.42	0.04	-	0.22	0.05 to 0.30	-	0.28 to 1.64	0.33 to 1.95
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0337	No connectivity	0.0191	0.00 to 0.07	-	0.01 to 0.14	0.00	-	0.00	0.00 to 0.07	-	0.01 to 0.14	0.01 to 0.21
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.0337	0.02 [b]	0.0191	0.03 to 0.74	0.04 to 0.97	0.02 to 0.41	0.16	0.30	0.09	0.19 to 0.90	0.34 to 1.27	0.11 to 0.50	0.63 to 2.66
Morecambe Offshore Windfarm Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0337	0.063 [b]	0.0191	0.00 to 0.10	0.32 to 7.36	0.05 to 1.26	0.01	0.99	0.09	0.02 to 0.11	1.31 to 8.35	0.14 to 1.35	1.47 to 9.80
Morgan Offshore Wind Project Generation Assets	430	425	630	2.88	13.79	10.02	0.0337	0.04 [b]	0.0191	0.04 to 1.01	0.05 to 1.19	0.04 to 0.84	0.10	0.55	0.19	0.14 to 1.11	0.60 to 1.74	0.23 to 1.03	0.97 to 3.89
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0337	0.04 [c]	0.0191	0.00 to 0.03	0.01 to 0.17	0.00 to 0.01	0.00	0.13	0.00	0.00 to 0.03	0.14 to 0.30	0.00 to 0.01	0.14 to 0.34
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.0337	No connectivity	0.0191	0.05 to 1.07	-	0.01 to 0.16	0.76	-	0.17	0.81 to 1.83	-	0.17 to 0.33	0.98 to 2.16
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.0337	No connectivity	0.0191	0.02 to 0.37	-	0.00 to 0.07	0.31	-	0.10	0.33 to 0.68	-	0.11 to 0.18	0.43 to 0.85
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.0337	0.04 [c]	0.0191	0.08 to 1.88	0.04 to 0.89	0.03 to 0.82	0.28	0.75	0.90	0.36 to 2.16	0.79 to 1.64	0.94 to 1.72	2.09 to 5.52
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.0337	No connectivity	0.0191	0.07 to 1.56	-	0.03 to 0.58	0.38	-	0.17	0.45 to 1.94	-	0.20 to 0.76	0.65 to 2.70
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.0337	No connectivity	0.0191	0.04 to 0.89	-	0.01 to 0.13	0.17	-	0.02	0.21 to 1.06	-	0.02 to 0.15	0.23 to 1.21
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0337	0.04 [c]	0.0191	0.00 to 0.03	0.00 to 0.06	0.00 to 0.02	0.01	0.05	0.01	0.01 to 0.04	0.05 to 0.10	0.01 to 0.02	0.07 to 0.17

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0337	0.02 [d]	0.0191	0.00 to 0.03	0.00 to 0.02	0.00 to 0.01	0.01	0.02	0.01	0.01 to 0.04	0.02 to 0.04	0.01 to 0.02	0.04 to 0.10
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0337	0.02 [d]	0.0191	0.00 to 0.09	0.00 to 0.07	0.00 to 0.05	0.02	0.03	0.01	0.02 to 0.11	0.03 to 0.10	0.02 to 0.06	0.07 to 0.27
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0337	0.02 [d]	0.0191	0.00 to 0.03	0.00 to 0.02	0.00 to 0.01	0.01	0.03	0.01	0.02 to 0.04	0.03 to 0.05	0.01 to 0.02	0.06 to 0.12
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0337	0.04 [c]	0.0191	0.00 to 0.04	0.00 to 0.06	0.00 to 0.02	0.01	0.05	0.01	0.02 to 0.05	0.06 to 0.11	0.01 to 0.03	0.09 to 0.20
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0337	0.02 [d]	0.0191	0.00 to 0.03	0.00 to 0.02	0.00 to 0.01	0.01	0.03	0.01	0.01 to 0.04	0.03 to 0.05	0.01 to 0.03	0.06 to 0.12
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0337	0.04 [c]	0.0191	0.00 to 0.07	0.00 to 0.10	0.00 to 0.04	0.02	0.07	0.02	0.02 to 0.09	0.08 to 0.18	0.02 to 0.06	0.12 to 0.32
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.0337	0.04 [c]	0.0191	0.00 to 0.05	0.00 to 0.07	0.00 to 0.03	0.01	0.13	0.01	0.01 to 0.06	0.13 to 0.20	0.01 to 0.03	0.15 to 0.30
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0337	0.04 [c]	0.0191	0.00 to 0.09	0.05 to 1.27	0.00 to 0.05	0.05	0.16	0.04	0.05 to 0.13	0.21 to 1.43	0.05 to 0.09	0.31 to 1.65
Total predicted impact (adult birds)										**0.49 to 11.47**	**0.57 to 13.39**	**0.28 to 6.54**	**2.88**	**3.98**	**2.44**	**3.37 to 14.35**	**4.56 to 17.37**	**2.72 to 8.98**	**10.65 to 40.70**
Increase in baseline mortality (%)										**0.01% to 0.22%**	**0.01% to 0.33%**	**0.01% to 0.16%**	**0.07%**	**0.10%**	**0.06%**	**0.08% to 0.36**	**0.11% to 0.43%**	**0.07% to 0.22%**	**0.26% to 1.01%**

1.4.3.8 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Rathlin Island SPA, one (Table 1.22) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.23) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.22: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Rathlin Island SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
	1%	9.30	9.34	9.39	9.43	9.48	9.52	9.75	10.42	11.54	12.66	13.79
	5%	9.30	9.52	9.75	9.97	10.20	10.42	11.54	14.91	20.51	26.12	31.73
	10%	9.30	9.75	10.20	10.65	11.09	11.54	13.79	20.51	31.73	42.94	54.15
	20%	9.30	10.20	11.09	11.99	12.89	13.79	18.27	31.73	54.15	76.58	99.01
	30%	9.30	10.65	11.99	13.34	14.68	16.03	22.76	42.94	76.58	110.22	143.86
	40%	9.30	11.09	12.89	14.68	16.48	18.27	27.24	54.15	99.01	143.86	188.71

50%	9.30	11.54	13.79	16.03	18.27	20.51	31.73	65.37	121.43	177.50	233.57
60%	9.30	11.99	14.68	17.37	20.06	22.76	36.21	76.58	143.86	211.14	278.42
70%	9.30	12.44	15.58	18.72	21.86	25.00	40.70	87.79	166.29	244.78	323.27
80%	9.30	12.89	16.48	20.06	23.65	27.24	45.18	99.01	188.71	278.42	368.13
90%	9.30	13.34	17.37	21.41	25.45	29.48	49.67	110.22	211.14	312.06	412.98
100%	9.30	13.79	18.27	22.76	27.24	31.73	54.15	121.43	233.57	345.70	457.84

Table 1.23: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Rathlin Island SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)	Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%) 0%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%
1%	0.23%	0.23%	0.23%	0.23%	0.24%	0.24%	0.24%	0.26%	0.29%	0.32%	0.34%
5%	0.23%	0.24%	0.24%	0.25%	0.25%	0.26%	0.29%	0.37%	0.51%	0.65%	0.79%
10%	0.23%	0.24%	0.25%	0.26%	0.28%	0.29%	0.34%	0.51%	0.79%	1.07%	1.35%
20%	0.23%	0.25%	0.28%	0.30%	0.32%	0.34%	0.45%	0.79%	1.35%	1.90%	2.46%
30%	0.23%	0.26%	0.30%	0.33%	0.37%	0.40%	0.57%	1.07%	1.90%	2.74%	3.58%
40%	0.23%	0.28%	0.32%	0.37%	0.41%	0.45%	0.68%	1.35%	2.46%	3.58%	4.69%
50%	0.23%	0.29%	0.34%	0.40%	0.45%	0.51%	0.79%	1.63%	3.02%	4.42%	5.81%
60%	0.23%	0.30%	0.37%	0.43%	0.50%	0.57%	0.90%	1.90%	3.58%	5.25%	6.93%
70%	0.23%	0.31%	0.39%	0.47%	0.54%	0.62%	1.01%	2.18%	4.14%	6.09%	8.04%
80%	0.23%	0.32%	0.41%	0.50%	0.59%	0.68%	1.12%	2.46%	4.69%	6.93%	9.16%
90%	0.23%	0.33%	0.43%	0.53%	0.63%	0.73%	1.24%	2.74%	5.25%	7.76%	10.27%
100%	0.23%	0.34%	0.45%	0.57%	0.68%	0.79%	1.35%	3.02%	5.81%	8.60%	11.39%

Lambay Island SPA

1.4.3.9 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Lambay Island SPA, an in-combination assessment is presented within Table 1.24 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.24: In-combination assessment for black-legged kittiwake from the Lambay Island SPA– when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation.

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.033.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.022.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.031.

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.41	0.0065	0.022 [b]	0.0049	0.00 to 0.07	0.01 to 0.13	0.00 to 0.02	0.05	0.26	0.02	0.06 to 0.13	0.26 to 0.39	0.02 to 0.04	0.34 to 0.56
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0065	0.022 [d]	0.0049	0.00 to 0.01	0.05 to 1.09	0.00 to 0.01	0.00	0.51	0.00	0.00 to 0.01	0.55 to 1.60	0.00 to 0.01	0.55 to 1.62

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.11	0.0065	0.031 [b]	0.0049	0.02 to 0.50	0.00 to 0.00	0.00 to 0.10	0.04	0.02	0.07	0.07 to 0.54	0.02 to 0.02	0.07 to 0.16	0.15 to 0.73
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.0065	0.050 [b]	0.0049	0.00 to 0.05	0.01 to 0.24	0.02 to 0.37	0.01	0.04	0.06	0.01 to 0.06	0.05 to 0.28	0.07 to 0.42	0.14 to 0.76
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0065	0.050 [e]	0.0049	0.00 to 0.01	0.00 to 0.01	0.00 to 0.04	0.00	0.49	0.00	0.00 to 0.01	0.49 to 0.50	0.00 to 0.04	0.49 to 0.55
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.47	0.0065	0.038 [b]	0.0049	0.01 to 0.14	0.08 to 1.84	0.00 to 0.11	0.03	0.56	0.02	0.04 to 0.17	0.64 to 2.40	0.03 to 0.13	0.71 to 2.70
Morecambe Offshore Windfarm Generation Assets	41	1,668	940	0.34	15.75	6.19	0.0065	0.0232 [b]	0.0049	0.00 to 0.02	0.12 to 2.71	0.01 to 0.32	0.00	0.37	0.02	0.00 to 0.02	0.48 to 3.07	0.04 to 0.35	0.52 to 3.44
Morgan Offshore Wind Project Generation Assets	430	425	630	2.88	13.79	11.51	0.0065	0.033 [b]	0.0049	0.01 to 0.20	0.04 to 0.98	0.01 to 0.22	0.02	0.46	0.05	0.03 to 0.21	0.50 to 1.44	0.06 to 0.27	0.58 to 1.92
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0065	0.033 [c]	0.0049	0.00 to 0.01	0.01 to 0.14	0.00 to 0.00	0.00	0.11	0.00	0.00 to 0.01	0.11 to 0.25	0.00 to 0.00	0.11 to 0.26
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.43	0.0065	No connectivity	0.0049	0.01 to 0.21	-	0.00 to 0.04	0.15	-	0.04	0.16 to 0.35	-	0.04 to 0.08	0.20 to 0.44
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.32	0.0065	No connectivity	0.0049	0.00 to 0.07	-	0.00 to 0.02	0.06	-	0.03	0.06 to 0.13	-	0.03 to 0.05	0.09 to 0.18
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	45.96	0.0065	0.033 [c]	0.0049	0.02 to 0.36	0.03 to 0.74	0.01 to 0.21	0.05	0.62	0.23	0.07 to 0.42	0.65 to 1.36	0.24 to 0.44	0.96 to 2.21
West of Orkney Windfarm	661	690	437	11.40	17.06	8.75	0.0065	No connectivity	0.0049	0.01 to 0.30	-	0.01 to 0.15	0.07	-	0.04	0.09 to 0.37	-	0.05 to 0.19	0.14 to 0.57
White Cross Offshore Windfarm	379	44	94	5.03	3.70	0.98	0.0065	0.050 [e]	0.0049	0.01 to 0.17	0.01 to 0.15	0.00 to 0.03	0.03	0.19	0.00	0.04 to 0.21	0.19 to 0.34	0.01 to 0.04	0.24 to 0.58
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0065	0.033 [c]	0.0049	0.00 to 0.01	0.00 to 0.05	0.00 to 0.00	0.00	0.04	0.00	0.00 to 0.01	0.04 to 0.09	0.00 to 0.01	0.05 to 0.10
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0065	0.022 [d]	0.0049	0.00 to 0.01	0.00 to 0.02	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.01	0.02 to 0.04	0.00 to 0.01	0.02 to 0.05
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0065	0.022 [d]	0.0049	0.00 to 0.02	0.00 to 0.08	0.00 to 0.01	0.00	0.03	0.00	0.00 to 0.02	0.04 to 0.11	0.00 to 0.02	0.04 to 0.15
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0065	0.022 [d]	0.0049	0.00 to 0.01	0.00 to 0.03	0.00 to 0.00	0.00	0.03	0.00	0.00 to 0.01	0.03 to 0.06	0.00 to 0.01	0.04 to 0.07
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0065	0.033 [c]	0.0049	0.00 to 0.01	0.00 to 0.05	0.00 to 0.01	0.00	0.04	0.00	0.00 to 0.01	0.05 to 0.09	0.00 to 0.01	0.05 to 0.11
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0065	0.022 [d]	0.0049	0.00 to 0.01	0.00 to 0.02	0.00 to 0.00	0.00	0.03	0.00	0.00 to 0.01	0.03 to 0.05	0.00 to 0.01	0.04 to 0.07
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0065	0.033 [c]	0.0049	0.00 to 0.01	0.00 to 0.09	0.00 to 0.01	0.00	0.06	0.01	0.00 to 0.02	0.06 to 0.15	0.01 to 0.01	0.07 to 0.18
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.0065	0.033 [c]	0.0049	0.00 to 0.01	0.00 to 0.06	0.00 to 0.01	0.00	0.11	0.00	0.00 to 0.01	0.11 to 0.17	0.00 to 0.01	0.11 to 0.19
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0065	0.033 [c]	0.0049	0.00 to 0.02	0.04 to 1.05	0.00 to 0.01	0.01	0.13	0.01	0.01 to 0.03	0.18 to 1.18	0.01 to 0.02	0.20 to 1.23

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Total predicted impact (adult birds)										0.09 to 2.21	0.41 to 9.48	0.07 to 1.68	0.56	4.10	0.62	0.65 to 2.77	4.51 to 13.58	0.70 to 2.30	5.85 to 18.65
Increase in baseline mortality (%)										0.01% to 0.23%	0.04% to 0.98%	0.01% to 0.17%	0.06%	0.42%	0.06%	0.07% to 0.29%	0.46% to 1.40%	0.07% to 0.24%	0.60% to 1.92%

1.4.3.10 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Lambay Island SPA, one (Table 1.25) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.26) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.22 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.6.2).

Table 1.25: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Lambay Island SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	5.28	5.28	5.28	5.28	5.28	5.28	5.28	5.28	5.28	5.28	5.28
	1%	5.28	5.30	5.32	5.34	5.36	5.38	5.47	5.76	6.23	6.71	7.19
	5%	5.28	5.38	5.47	5.57	5.66	5.76	6.23	7.67	10.06	12.44	14.83
	10%	5.28	5.47	5.66	5.85	6.04	6.23	7.19	10.06	14.83	19.61	24.38
	20%	5.28	5.66	6.04	6.43	6.81	7.19	9.10	14.83	24.38	33.93	43.48
	30%	5.28	5.85	6.43	7.00	7.57	8.15	11.01	19.61	33.93	48.26	62.59
	40%	5.28	6.04	6.81	7.57	8.34	9.10	12.92	24.38	43.48	62.59	81.69
	50%	5.28	6.23	7.19	8.15	9.10	10.06	14.83	29.16	53.03	76.91	100.79
	60%	5.28	6.43	7.57	8.72	9.86	11.01	16.74	33.93	62.59	91.24	119.89
	70%	5.28	6.62	7.95	9.29	10.63	11.97	18.65	38.71	72.14	105.56	138.99
	80%	5.28	6.81	8.34	9.86	11.39	12.92	20.56	43.48	81.69	119.89	158.09
	90%	5.28	7.00	8.72	10.44	12.16	13.88	22.47	48.26	91.24	134.22	177.20
	100%	5.28	7.19	9.10	11.01	12.92	14.83	24.38	53.03	100.79	148.54	196.30

Table 1.26: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Lambay Island SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%
	1%	0.54%	0.55%	0.55%	0.55%	0.55%	0.55%	0.56%	0.59%	0.64%	0.69%	0.74%
	5%	0.54%	0.55%	0.56%	0.57%	0.58%	0.59%	0.64%	0.79%	1.04%	1.28%	1.53%

10%	0.54%	0.56%	0.58%	0.60%	0.62%	0.64%	0.74%	1.04%	1.53%	2.02%	2.52%
20%	0.54%	0.58%	0.62%	0.66%	0.70%	0.74%	0.94%	1.53%	2.52%	3.50%	4.49%
30%	0.54%	0.60%	0.66%	0.72%	0.78%	0.84%	1.14%	2.02%	3.50%	4.98%	6.46%
40%	0.54%	0.62%	0.70%	0.78%	0.86%	0.94%	1.33%	2.52%	4.49%	6.46%	8.43%
50%	0.54%	0.64%	0.74%	0.84%	0.94%	1.04%	1.53%	3.01%	5.47%	7.93%	10.40%
60%	0.54%	0.66%	0.78%	0.90%	1.02%	1.14%	1.73%	3.50%	6.46%	9.41%	12.37%
70%	0.54%	0.68%	0.82%	0.96%	1.10%	1.23%	1.92%	3.99%	7.44%	10.89%	14.34%
80%	0.54%	0.70%	0.86%	1.02%	1.18%	1.33%	2.12%	4.49%	8.43%	12.37%	16.31%
90%	0.54%	0.72%	0.90%	1.08%	1.25%	1.43%	2.32%	4.98%	9.41%	13.85%	18.28%
100%	0.54%	0.74%	0.94%	1.14%	1.33%	1.53%	2.52%	5.47%	10.40%	15.32%	20.25%

Ireland's Eye SPA

1.4.3.11 As combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Ireland's Eye SPA, an in-combination assessment is presented within Table 1.27 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.27: In-combination assessment for black-legged kittiwake from the Ireland's Eye SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation.

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.013.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.01.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.026.

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.0015	0.01 [b]	0.0011	0.00 to 0.02	0.00 to 0.06	0.00 to 0.00	0.01	0.12	0.00	0.01 to 0.03	0.12 to 0.18	0.01 to 0.01	0.14 to 0.22
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0015	0.01 [d]	0.0011	0.00 to 0.00	0.02 to 0.49	0.00 to 0.00	0.00	0.23	0.00	0.00 to 0.00	0.25 to 0.73	0.00 to 0.00	0.25 to 0.73
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.0015	0.016 [b]	0.0011	0.00 to 0.12	0.00 to 0.00	0.00 to 0.02	0.01	0.01	0.01	0.02 to 0.13	0.01 to 0.01	0.02 to 0.04	0.04 to 0.17
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.0015	0.026 [b]	0.0011	0.00 to 0.01	0.01 to 0.12	0.00 to 0.08	0.00	0.02	0.01	0.00 to 0.01	0.03 to 0.15	0.02 to 0.09	0.05 to 0.25
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0015	0.026 [e]	0.0011	0.00 to 0.00	0.00 to 0.01	0.00 to 0.01	0.00	0.25	0.00	0.00 to 0.00	0.25 to 0.26	0.00 to 0.01	0.25 to 0.27
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.0015	0.016 [b]	0.0011	0.00 to 0.03	0.03 to 0.78	0.00 to 0.02	0.01	0.24	0.01	0.01 to 0.04	0.27 to 1.01	0.01 to 0.03	0.28 to 1.08
Morecambe Offshore Windfarm Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0015	0.0104 [b]	0.0011	0.00 to 0.00	0.05 to 1.21	0.00 to 0.07	0.00	0.16	0.01	0.00 to 0.00	0.22 to 1.38	0.01 to 0.08	0.22 to 1.46
Morgan Offshore Wind Project Generation Assets	430	425	630	2.88	13.79	10.02	0.0015	0.013 [b]	0.0011	0.00 to 0.05	0.02 to 0.39	0.00 to 0.05	0.00	0.18	0.01	0.01 to 0.05	0.20 to 0.57	0.01 to 0.06	0.22 to 0.67
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0021	0.013 [c]	0.0012	0.00 to 0.00	0.00 to 0.05	0.00 to 0.00	0.00	0.04	0.00	0.00 to 0.00	0.04 to 0.10	0.00 to 0.00	0.04 to 0.10

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.0015	No connectivity	0.0011	0.00 to 0.05	-	0.00 to 0.01	0.03	-	0.01	0.04 to 0.08	-	0.01 to 0.02	0.05 to 0.10
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.0015	No connectivity	0.0011	0.00 to 0.02	-	0.00 to 0.00	0.01	-	0.01	0.01 to 0.03	-	0.01 to 0.01	0.02 to 0.04
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.0015	0.013 [c]	0.0011	0.00 to 0.08	0.01 to 0.29	0.00 to 0.05	0.01	0.24	0.05	0.02 to 0.10	0.26 to 0.53	0.05 to 0.10	0.33 to 0.73
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.0015	No connectivity	0.0011	0.00 to 0.07	-	0.00 to 0.03	0.02	-	0.01	0.02 to 0.09	-	0.01 to 0.04	0.03 to 0.13
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.0015	0.026 [e]	0.0011	0.00 to 0.04	0.00 to 0.08	0.00 to 0.01	0.01	0.10	0.00	0.01 to 0.05	0.10 to 0.18	0.00 to 0.01	0.11 to 0.23
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0015	0.013 [c]	0.0011	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.02 to 0.03	0.00 to 0.00	0.02 to 0.04
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0015	0.01 [d]	0.0011	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.02	0.00 to 0.00	0.01 to 0.02
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0015	0.01 [d]	0.0011	0.00 to 0.00	0.00 to 0.04	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.02 to 0.05	0.00 to 0.00	0.02 to 0.06
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0015	0.01 [d]	0.0011	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.02 to 0.03	0.00 to 0.00	0.02 to 0.03
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0015	0.013 [c]	0.0011	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.02 to 0.04	0.00 to 0.00	0.02 to 0.04
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0015	0.01 [d]	0.0011	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.02	0.00 to 0.00	0.02 to 0.03
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0015	0.013 [c]	0.0011	0.00 to 0.00	0.00 to 0.03	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.02 to 0.06	0.00 to 0.00	0.03 to 0.06
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.0065	0.013 [c]	0.0015	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.04	0.00	0.00 to 0.00	0.04 to 0.07	0.00 to 0.00	0.04 to 0.07
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0015	0.013 [c]	0.0011	0.00 to 0.00	0.02 to 0.41	0.00 to 0.00	0.00	0.05	0.00	0.00 to 0.01	0.07 to 0.47	0.00 to 0.01	0.07 to 0.48
Total predicted impact (adult birds)										**0.02 to 0.51**	**0.17 to 4.07**	**0.02 to 0.38**	**0.13**	**1.79**	**0.14**	**0.15 to 0.64**	**1.97 to 5.86**	**0.16 to 0.52**	**2.28 to 7.02**
Increase in baseline mortality (%)										**0.00% to 0.11%**	**0.04% to 0.90%**	**0.00% to 0.08%**	**0.03%**	**0.40%**	**0.03%**	**0.03% to 0.14%**	**0.44% to 1.30%**	**0.03% to 0.11%**	**0.50% to 1.55%**

1.4.3.12 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Ireland's Eye SPA, one (Table 1.28) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.29) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.28: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Ireland's Eye SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
	1%	2.06	2.07	2.08	2.08	2.09	2.10	2.13	2.24	2.42	2.59	2.77
	5%	2.06	2.10	2.13	2.17	2.21	2.24	2.42	2.95	3.83	4.72	5.60
	10%	2.06	2.13	2.21	2.28	2.35	2.42	2.77	3.83	5.60	7.37	9.14
	20%	2.06	2.21	2.35	2.49	2.63	2.77	3.48	5.60	9.14	12.68	16.22
	30%	2.06	2.28	2.49	2.70	2.91	3.13	4.19	7.37	12.68	17.99	23.30
	40%	2.06	2.35	2.63	2.91	3.20	3.48	4.89	9.14	16.22	23.30	30.38
	50%	2.06	2.42	2.77	3.13	3.48	3.83	5.60	10.91	19.76	28.61	37.46
	60%	2.06	2.49	2.91	3.34	3.76	4.19	6.31	12.68	23.30	33.92	44.53
	70%	2.06	2.56	3.05	3.55	4.05	4.54	7.02	14.45	26.84	39.23	51.61
	80%	2.06	2.63	3.20	3.76	4.33	4.89	7.73	16.22	30.38	44.53	58.69
	90%	2.06	2.70	3.34	3.97	4.61	5.25	8.43	17.99	33.92	49.84	65.77
	100%	2.06	2.77	3.48	4.19	4.89	5.60	9.14	19.76	37.46	55.15	72.85

Table 1.29: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Ireland's Eye SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%
	1%	0.45%	0.46%	0.46%	0.46%	0.46%	0.46%	0.47%	0.50%	0.53%	0.57%	0.61%
	5%	0.45%	0.46%	0.47%	0.48%	0.49%	0.50%	0.53%	0.65%	0.85%	1.04%	1.24%
	10%	0.45%	0.47%	0.49%	0.50%	0.52%	0.53%	0.61%	0.85%	1.24%	1.63%	2.02%
	20%	0.45%	0.49%	0.52%	0.55%	0.58%	0.61%	0.77%	1.24%	2.02%	2.80%	3.58%
	30%	0.45%	0.50%	0.55%	0.60%	0.64%	0.69%	0.93%	1.63%	2.80%	3.97%	5.15%
	40%	0.45%	0.52%	0.58%	0.64%	0.71%	0.77%	1.08%	2.02%	3.58%	5.15%	6.71%
	50%	0.45%	0.53%	0.61%	0.69%	0.77%	0.85%	1.24%	2.41%	4.37%	6.32%	8.28%
	60%	0.45%	0.55%	0.64%	0.74%	0.83%	0.93%	1.39%	2.80%	5.15%	7.49%	9.84%
	70%	0.45%	0.57%	0.67%	0.78%	0.89%	1.00%	1.55%	3.19%	5.93%	8.67%	11.40%
	80%	0.45%	0.58%	0.71%	0.83%	0.96%	1.08%	1.71%	3.58%	6.71%	9.84%	12.97%
	90%	0.45%	0.60%	0.74%	0.88%	1.02%	1.16%	1.86%	3.97%	7.49%	11.01%	14.53%
	100%	0.45%	0.61%	0.77%	0.93%	1.08%	1.24%	2.02%	4.37%	8.28%	12.19%	16.10%

Howth Head Coast SPA

1.4.3.13 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Howth Head Coast SPA, an in-combination assessment is presented within Table 1.30 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.30: In-combination assessment for black-legged kittiwake from the Howth Head Coast SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation.

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.027.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.02.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.053.

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.0036	0.02 [b]	0.0027	0.00 to 0.04	0.01 to 0.12	0.00 to 0.01	0.03	0.23	0.01	0.03 to 0.07	0.24 to 0.36	0.01 to 0.02	0.28 to 0.45
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0036	0.02 [d]	0.0027	0.00 to 0.01	0.04 to 0.99	0.00 to 0.00	0.00	0.46	0.00	0.00 to 0.01	0.50 to 1.45	0.00 to 0.00	0.50 to 1.46
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.0036	0.033 [b]	0.0027	0.01 to 0.28	0.00 to 0.00	0.00 to 0.05	0.02	0.02	0.04	0.04 to 0.30	0.02 to 0.02	0.04 to 0.09	0.09 to 0.41
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.0036	0.053 [b]	0.0027	0.00 to 0.03	0.01 to 0.25	0.01 to 0.20	0.00	0.05	0.03	0.01 to 0.03	0.06 to 0.30	0.04 to 0.23	0.10 to 0.56
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0036	0.053 [e]	0.0027	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.52	0.00	0.00 to 0.01	0.52 to 0.53	0.00 to 0.02	0.52 to 0.56
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.0036	0.018 [b]	0.0027	0.00 to 0.08	0.04 to 0.87	0.00 to 0.06	0.02	0.27	0.01	0.02 to 0.10	0.30 to 1.14	0.01 to 0.07	0.34 to 1.30
Morecambe Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0036	0.0238 [b]	0.0027	0.00 to 0.01	0.12 to 2.78	0.01 to 0.18	0.00	0.37	0.01	0.00 to 0.01	0.49 to 3.15	0.02 to 0.19	0.52 to 3.36
Morgan Generation Assets	430	425	630	2.88	13.79	10.02	0.0036	0.027 [b]	0.0027	0.00 to 0.11	0.03 to 0.80	0.01 to 0.12	0.01	0.37	0.03	0.02 to 0.12	0.41 to 1.18	0.03 to 0.15	0.45 to 1.44
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0036	0.027 [c]	0.0027	0.00 to 0.00	0.00 to 0.11	0.00 to 0.00	0.00	0.09	0.00	0.00 to 0.00	0.09 to 0.20	0.00 to 0.00	0.09 to 0.21
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.0036	No connectivity	0.0027	0.00 to 0.11	-	0.00 to 0.02	0.08	-	0.02	0.09 to 0.20		0.02 to 0.05	0.11 to 0.24
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.0036	No connectivity	0.0027	0.00 to 0.04	-	0.00 to 0.01	0.03	-	0.01	0.03 to 0.07		0.02 to 0.02	0.05 to 0.10
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.0036	0.027 [c]	0.0027	0.01 to 0.20	0.03 to 0.60	0.00 to 0.12	0.03	0.51	0.13	0.04 to 0.23	0.53 to 1.11	0.13 to 0.24	0.70 to 1.58
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.0036	No connectivity	0.0027	0.01 to 0.17	-	0.00 to 0.08	0.04	-	0.02	0.05 to 0.21	-	0.03 to 0.11	0.08 to 0.31
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.0036	0.053 [e]	0.0027	0.00 to 0.10	0.01 to 0.16	0.00 to 0.02	0.02	0.20	0.00	0.02 to 0.11	0.20 to 0.36	0.00 to 0.02	0.23 to 0.49
Gap-filled projects																			

Plan or project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0036	0.027 [c]	0.0011	0.00 to 0.00	0.00 to 0.04	0.00 to 0.00	0.00	0.03	0.00	0.00 to 0.00	0.03 to 0.07	0.00 to 0.00	0.04 to 0.08
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0036	0.02 [d]	0.0011	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.02 to 0.04	0.00 to 0.00	0.02 to 0.04
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0036	0.02 [d]	0.0011	0.00 to 0.01	0.00 to 0.07	0.00 to 0.01	0.00	0.03	0.00	0.00 to 0.01	0.03 to 0.10	0.00 to 0.01	0.04 to 0.12
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0036	0.02 [d]	0.0011	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.03	0.00	0.00 to 0.00	0.03 to 0.05	0.00 to 0.00	0.03 to 0.06
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0036	0.027 [c]	0.0011	0.00 to 0.00	0.00 to 0.04	0.00 to 0.00	0.00	0.04	0.00	0.00 to 0.01	0.04 to 0.08	0.00 to 0.00	0.04 to 0.09
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0036	0.02 [d]	0.0011	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.03	0.00	0.00 to 0.00	0.03 to 0.05	0.00 to 0.00	0.03 to 0.06
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0036	0.027 [c]	0.0011	0.00 to 0.01	0.00 to 0.07	0.00 to 0.01	0.00	0.05	0.00	0.00 to 0.01	0.05 to 0.12	0.00 to 0.01	0.06 to 0.14
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.0036	0.027 [c]	0.0015	0.00 to 0.01	0.00 to 0.05	0.00 to 0.00	0.00	0.09	0.00	0.00 to 0.01	0.09 to 0.14	0.00 to 0.00	0.09 to 0.15
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0036	0.027 [c]	0.0011	0.00 to 0.01	0.04 to 0.86	0.00 to 0.01	0.01	0.11	0.01	0.01 to 0.01	0.14 to 0.97	0.01 to 0.01	0.16 to 0.99
Total predicted impact (adult birds)										0.05 to 1.22	0.34 to 7.91	0.04 to 0.92	**0.31**	**3.49**	**0.34**	**0.36 to 1.53**	**3.83 to 11.40**	**0.38 to 1.27**	**4.58 to 14.20**
Increase in baseline mortality (%)										0.01% to 0.23%	0.06% to 1.51%	0.01% to 0.18%	**0.06%**	**0.67%**	**0.07%**	**0.07% to 0.29%**	**0.73% to 2.18%**	**0.07% to 0.24%**	**0.87% to 2.71%**

1.4.3.14 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Howth Head Coast SPA, one (Table 1.31) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.32) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.31: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Howth Head Coast SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14
	1%	4.14	4.16	4.17	4.19	4.20	4.22	4.29	4.50	4.86	5.22	5.58
	5%	4.14	4.22	4.29	4.36	4.43	4.50	4.86	5.94	7.74	9.53	11.33
	10%	4.14	4.29	4.43	4.58	4.72	4.86	5.58	7.74	11.33	14.92	18.52

20%	4.14	4.43	4.72	5.01	5.29	5.58	7.02	11.33	18.52	25.70	32.89
30%	4.14	4.58	5.01	5.44	5.87	6.30	8.46	14.92	25.70	36.48	47.26
40%	4.14	4.72	5.29	5.87	6.44	7.02	9.89	18.52	32.89	47.26	61.63
50%	4.14	4.86	5.58	6.30	7.02	7.74	11.33	22.11	40.07	58.04	76.00
60%	4.14	5.01	5.87	6.73	7.59	8.46	12.77	25.70	47.26	68.81	90.37
70%	4.14	5.15	6.16	7.16	8.17	9.17	14.20	29.29	54.44	79.59	104.74
80%	4.14	5.29	6.44	7.59	8.74	9.89	15.64	32.89	61.63	90.37	119.11
90%	4.14	5.44	6.73	8.02	9.32	10.61	17.08	36.48	68.81	101.15	133.48
100%	4.14	5.58	7.02	8.46	9.89	11.33	18.52	40.07	76.00	111.93	147.85

Table 1.32: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Howth Head Coast SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	0.79%	0.79%	0.79%	0.79%	0.79%	0.79%	0.79%	0.79%	0.79%	0.79%	0.79%
	1%	0.79%	0.79%	0.80%	0.80%	0.80%	0.81%	0.82%	0.86%	0.93%	1.00%	1.07%
	5%	0.79%	0.81%	0.82%	0.83%	0.85%	0.86%	0.93%	1.13%	1.48%	1.82%	2.16%
	10%	0.79%	0.82%	0.85%	0.87%	0.90%	0.93%	1.07%	1.48%	2.16%	2.85%	3.54%
	20%	0.79%	0.85%	0.90%	0.96%	1.01%	1.07%	1.34%	2.16%	3.54%	4.91%	6.28%
	30%	0.79%	0.87%	0.96%	1.04%	1.12%	1.20%	1.62%	2.85%	4.91%	6.97%	9.03%
	40%	0.79%	0.90%	1.01%	1.12%	1.23%	1.34%	1.89%	3.54%	6.28%	9.03%	11.77%
	50%	0.79%	0.93%	1.07%	1.20%	1.34%	1.48%	2.16%	4.22%	7.65%	11.08%	14.52%
	60%	0.79%	0.96%	1.12%	1.29%	1.45%	1.62%	2.44%	4.91%	9.03%	13.14%	17.26%
	70%	0.79%	0.98%	1.18%	1.37%	1.56%	1.75%	2.71%	5.60%	10.40%	15.20%	20.01%
	80%	0.79%	1.01%	1.23%	1.45%	1.67%	1.89%	2.99%	6.28%	11.77%	17.26%	22.75%
	90%	0.79%	1.04%	1.29%	1.53%	1.78%	2.03%	3.26%	6.97%	13.14%	19.32%	25.50%
	100%	0.79%	1.07%	1.34%	1.62%	1.89%	2.16%	3.54%	7.65%	14.52%	21.38%	28.24%

Wicklow Head SPA

1.4.3.15 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Wicklow Head SPA, an in-combination assessment is presented within Table 1.33 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.33: In-combination assessment for black-legged kittiwake from the Wicklow Head SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation.

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.004.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.05.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.019.

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.008	0.005 [b]	0.006	0.00 to 0.09	0.00 to 0.03	0.00 to 0.02	0.07	0.03	0.03	0.07 to 0.16	0.06 to 0.09	0.03 to 0.05	0.16 to 0.29
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.008	0.005 [d]	0.006	0.00 to 0.02	0.01 to 0.25	0.00 to 0.01	0.00	0.06	0.00	0.00 to 0.02	0.13 to 0.36	0.00 to 0.01	0.13 to 0.39
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.008	0.013 [b]	0.006	0.03 to 0.62	0.00 to 0.00	0.01 to 0.12	0.05	0.00	0.08	0.08 to 0.67	0.01 to 0.01	0.09 to 0.20	0.17 to 0.88
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.008	0.019 [b]	0.006	0.00 to 0.06	0.00 to 0.09	0.02 to 0.45				0.01 to 0.07	0.02 to 0.11	0.09 to 0.52	0.12 to 0.70
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.008	0.019 [e]	0.006	0.00 to 0.02	0.00 to 0.01	0.00 to 0.04	0.00	0.07	0.00	0.00 to 0.02	0.18 to 0.19	0.00 to 0.04	0.19 to 0.25
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.008	0.006 [b]	0.006	0.01 to 0.17	0.01 to 0.29	0.01 to 0.13	0.04	0.05	0.03	0.05 to 0.21	0.10 to 0.38	0.03 to 0.16	0.18 to 0.75
Morecambe Offshore Windfarm Generation Assets	41	1,668	940	0.34	15.75	4.65	0.008	0.004 [b]	0.006	0.00 to 0.02	0.02 to 0.47	0.02 to 0.39	0.02	0.03	0.04	0.00 to 0.03	0.08 to 0.53	0.04 to 0.42	0.13 to 0.98
Morgan Offshore Wind Project Generation Assets	430	425	630	2.88	13.79	10.02	0.008	0.004 [b]	0.006	0.01 to 0.24	0.01 to 0.12	0.01 to 0.26	0.06	0.01	0.07	0.03 to 0.26	0.06 to 0.17	0.07 to 0.32	0.17 to 0.76
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0021	0.004 [c]	0.0012	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.03	0.00 to 0.00	0.01 to 0.03
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.008	No connectivity	0.006	0.01 to 0.25	-	0.00 to 0.05	0.18	-	0.05	0.19 to 0.43	-	0.05 to 0.10	0.25 to 0.54
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.008	No connectivity	0.006	0.00 to 0.09	-	0.00 to 0.02	0.07	-	0.03	0.08 to 0.16	-	0.03 to 0.06	0.11 to 0.22
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.008	0.004 [c]	0.006	0.02 to 0.45	0.00 to 0.09	0.01 to 0.26	0.06	0.06	0.28	0.09 to 0.51	0.08 to 0.16	0.29 to 0.54	0.46 to 1.22
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.008	No connectivity	0.006	0.02 to 0.37	-	0.01 to 0.18	0.09	-	0.05	0.11 to 0.46	-	0.06 to 0.24	0.17 to 0.70
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.008	0.013 [e]	0.006	0.01 to 0.21	0.00 to 0.06	0.00 to 0.04	0.04	0.03	0.01	0.05 to 0.25	0.07 to 0.13	0.01 to 0.05	0.13 to 0.43
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.008	0.004 [c]	0.006	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00				0.00 to 0.01	0.01 to 0.01	0.00 to 0.01	0.01 to 0.03

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Burbo Bank	12	14	11	0.29	0.84	0.46	0.008	0.005 [d]	0.006	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.01 to 0.03
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.008	0.005 [d]	0.006	0.00 to 0.02	0.00 to 0.02	0.00 to 0.01	0.00	0.00	0.00	0.00 to 0.03	0.01 to 0.03	0.01 to 0.02	0.02 to 0.07
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.008	0.005 [d]	0.006	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00				0.00 to 0.01	0.01 to 0.01	0.00 to 0.01	0.01 to 0.03
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.008	0.004 [c]	0.006	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00	0.00	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.01	0.01 to 0.03
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.008	0.005 [d]	0.006	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.01	0.01 to 0.03
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.008	0.004 [c]	0.006	0.00 to 0.02	0.00 to 0.01	0.00 to 0.01	0.00	0.01	0.01	0.01 to 0.02	0.01 to 0.02	0.01 to 0.02	0.02 to 0.06
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.008	0.004 [c]	0.006	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.02	0.00 to 0.01	0.02 to 0.04
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.008	0.004 [c]	0.006	0.00 to 0.02	0.00 to 0.13	0.00 to 0.01	0.01	0.01	0.01	0.01 to 0.03	0.02 to 0.14	0.01 to 0.03	0.05 to 0.20
Total predicted impact (adult birds)										**0.12 to 2.72**	**0.07 to 1.61**	**0.09 to 2.05**	**0.71**	**0.36**	**0.69**	**0.80 to 3.40**	**0.88 to 2.43**	**0.85 to 2.82**	**2.54 to 8.64**
Increase in baseline mortality (%)										**0.06% to 1.38%**	**0.03% to 0.82%**	**0.04% to 1.04%**	**0.36%**	**0.18%**	**0.35%**	**0.41% to 1.73%**	**0.45% to 1.23%**	**0.43% to 1.43%**	**1.29% to 4.39%**

1.4.3.16 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Wicklow Head SPA, one (Table 1.34) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.35) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.34: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Wicklow Head SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27
	1%	2.27	2.28	2.29	2.30	2.30	2.31	2.36	2.50	2.72	2.95	3.18
	5%	2.27	2.31	2.36	2.40	2.45	2.50	2.72	3.41	4.55	5.68	6.82
	10%	2.27	2.36	2.45	2.54	2.63	2.72	3.18	4.55	6.82	9.10	11.38
	20%	2.27	2.45	2.63	2.81	3.00	3.18	4.09	6.82	11.38	15.93	20.49
	30%	2.27	2.54	2.81	3.09	3.36	3.63	5.00	9.10	15.93	22.76	29.59
	40%	2.27	2.63	3.00	3.36	3.73	4.09	5.91	11.38	20.49	29.59	38.70
	50%	2.27	2.72	3.18	3.63	4.09	4.55	6.82	13.65	25.04	36.43	47.81

60%	2.27	2.81	3.36	3.91	4.45	5.00	7.73	15.93	29.59	43.26	56.92
70%	2.27	2.91	3.54	4.18	4.82	5.46	8.64	18.21	34.15	50.09	66.03
80%	2.27	3.00	3.73	4.45	5.18	5.91	9.56	20.49	38.70	56.92	75.14
90%	2.27	3.09	3.91	4.73	5.55	6.37	10.47	22.76	43.26	63.75	84.25
100%	2.27	3.18	4.09	5.00	5.91	6.82	11.38	25.04	47.81	70.58	93.36

Table 1.35: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Wicklow Head SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%
	1%	1.15%	1.16%	1.16%	1.17%	1.17%	1.18%	1.20%	1.27%	1.38%	1.50%	1.62%
	5%	1.15%	1.18%	1.20%	1.22%	1.25%	1.27%	1.38%	1.73%	2.31%	2.89%	3.47%
	10%	1.15%	1.20%	1.25%	1.29%	1.34%	1.38%	1.62%	2.31%	3.47%	4.62%	5.78%
	20%	1.15%	1.25%	1.34%	1.43%	1.52%	1.62%	2.08%	3.47%	5.78%	8.10%	10.41%
	30%	1.15%	1.29%	1.43%	1.57%	1.71%	1.85%	2.54%	4.62%	8.10%	11.57%	15.04%
	40%	1.15%	1.34%	1.52%	1.71%	1.89%	2.08%	3.00%	5.78%	10.41%	15.04%	19.67%
	50%	1.15%	1.38%	1.62%	1.85%	2.08%	2.31%	3.47%	6.94%	12.72%	18.51%	24.30%
	60%	1.15%	1.43%	1.71%	1.99%	2.26%	2.54%	3.93%	8.10%	15.04%	21.98%	28.92%
	70%	1.15%	1.48%	1.80%	2.12%	2.45%	2.77%	4.39%	9.25%	17.35%	25.45%	33.55%
	80%	1.15%	1.52%	1.89%	2.26%	2.63%	3.00%	4.86%	10.41%	19.67%	28.92%	38.18%
	90%	1.15%	1.57%	1.99%	2.40%	2.82%	3.24%	5.32%	11.57%	21.98%	32.39%	42.81%
	100%	1.15%	1.62%	2.08%	2.54%	3.00%	3.47%	5.78%	12.72%	24.30%	35.87%	47.44%

Cape Wrath SPA

1.4.3.17 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Cape Wrath SPA, an in-combination assessment is presented within Table 1.36 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.36: In-combination assessment for black-legged kittiwake from the Cape Wrath – when considering the 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.044	No connectivity	0.0249	0.02 to 0.50	-	0.00 to 0.08	0.37	-	0.11	0.39 to 0.86	-	0.12 to 0.19	0.50 to 1.06
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.044	No connectivity	0.0249	0.00 to 0.08	-	0.00 to 0.04	0.00	-	0.00	0.00 to 0.08	-	0.00 to 0.04	0.01 to 0.13
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.044	No connectivity	0.0249	0.15 to 3.38	-	0.02 to 0.48	0.30	-	0.34	0.44 to 3.68	-	0.36 to 0.82	0.80 to 4.50
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.044	No connectivity	0.0249	0.01 to 0.34	-	0.08 to 1.85	0.05	-	0.29	0.07 to 0.40	-	0.37 to 2.14	0.43 to 2.54
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.044	No connectivity	0.0249	0.00 to 0.09	-	0.01 to 0.18	0.00	-	0.00	0.00 to 0.09	-	0.01 to 0.18	0.01 to 0.27
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.044	No connectivity	0.0249	0.04 to 0.96	-	0.02 to 0.53	0.21	-	0.11	0.25 to 1.17	-	0.14 to 0.65	0.39 to 1.82
Morecambe Generation Assets	41	1,668	940	0.34	15.75	4.65	0.044	No connectivity	0.0249	0.01 to 0.13	-	0.07 to 1.64	0.01	-	0.12	0.02 to 0.14	-	0.19 to 1.75	0.21 to 1.90
Morgan Generation Assets	430	425	630	2.88	13.79	10.02	0.044	No connectivity	0.0249	0.06 to 1.32	-	0.05 to 1.10	0.13	-	0.25	0.18 to 1.45	-	0.30 to 1.35	0.48 to 2.80
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.044	No connectivity	0.0249	0.00 to 0.04	-	0.00 to 0.02	0.00	-	0.00	0.00 to 0.04	-	0.00 to 0.02	0.00 to 0.06
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.044	No connectivity	0.0249	0.06 to 1.39	-	0.01 to 0.21	1.00	-	0.22	1.06 to 2.39	-	0.22 to 0.43	1.28 to 2.82
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.044	No connectivity	0.0249	0.02 to 0.48	-	0.00 to 0.09	0.41	-	0.14	0.43 to 0.88	-	0.14 to 0.23	0.57 to 1.11
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.044	No connectivity	0.0249	0.11 to 2.45	-	0.05 to 1.06	0.36	-	1.18	0.47 to 2.82	-	1.22 to 2.24	1.69 to 5.06
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.044	0.246	0.0249	0.09 to 2.04	0.46 to 10.83	0.03 to 0.76	0.50	3.83	0.22	0.59 to 2.54	4.29 to 14.66	0.26 to 0.99	5.14 to 18.19
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.044	No connectivity	0.0249	0.05 to 1.17	-	0.01 to 0.16	0.22	-	0.03	0.27 to 1.39	-	0.03 to 0.19	0.30 to 1.58

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.044	No connectivity	0.0249	0.00 to 0.04	-	0.00 to 0.02	0.01	-	0.01	0.02 to 0.05	-	0.01 to 0.03	0.03 to 0.08
Burbo Bank	12	14	11	0.29	0.84	0.46	0.044	No connectivity	0.0249	0.00 to 0.04	-	0.00 to 0.02	0.01	-	0.01	0.01 to 0.05	-	0.01 to 0.03	0.03 to 0.08
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.044	No connectivity	0.0249	0.01 to 0.12	-	0.00 to 0.06	0.02	-	0.02	0.03 to 0.14	-	0.02 to 0.08	0.05 to 0.22
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.044	No connectivity	0.0249	0.00 to 0.04	-	0.00 to 0.02	0.02	-	0.01	0.02 to 0.05	-	0.01 to 0.03	0.03 to 0.09
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.044	No connectivity	0.0249	0.00 to 0.05	-	0.00 to 0.03	0.02	-	0.02	0.02 to 0.07	-	0.02 to 0.04	0.04 to 0.11
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.044	No connectivity	0.0249	0.00 to 0.04	-	0.00 to 0.02	0.02	-	0.02	0.02 to 0.05	-	0.02 to 0.04	0.04 to 0.09
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.044	No connectivity	0.0249	0.00 to 0.09	-	0.00 to 0.05	0.03	-	0.03	0.03 to 0.12	-	0.03 to 0.07	0.06 to 0.19
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.044	No connectivity	0.0249	0.00 to 0.07	-	0.00 to 0.03	0.01	-	0.01	0.02 to 0.08	-	0.01 to 0.04	0.03 to 0.12
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.044	No connectivity	0.0249	0.00 to 0.11	-	0.00 to 0.06	0.06	-	0.06	0.07 to 0.18	-	0.06 to 0.12	0.13 to 0.29
Total predicted impact (adult birds)										**0.64 to 14.97**	**0.46 to 10.83**	**0.37 to 8.53**	**3.76**	**3.83**	**3.18**	**4.40 to 18.73**	**4.29 to 14.66**	**3.54 to 11.71**	**12.24 to 45.10**
Increase in baseline mortality (%)										**0.02% to 0.50%**	**0.02% to 0.36%**	**0.01% to 0.28%**	**0.12%**	**0.13%**	**0.11%**	**0.15% to 0.62%**	**0.14% to 0.49%**	**0.12% to 0.39%**	**0.41% to 1.49%**

1.4.3.18 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Cape Wrath SPA, one (Table 1.37) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.38) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.22 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.6.2).

Table 1.37: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Cape Wrath SPA.

Black-legged kittiwake (Annual – number of adults)	Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%) 0%	10.77	10.77	10.77	10.77	10.77	10.77	10.77	10.77	10.77	10.77	10.77
1%	10.77	10.81	10.86	10.91	10.96	11.01	11.26	11.99	13.22	14.44	15.67
5%	10.77	11.01	11.26	11.50	11.75	11.99	13.22	16.90	23.03	29.16	35.29

10%	10.77	11.26	11.75	12.24	12.73	13.22	15.67	23.03	35.29	47.55	59.81
20%	10.77	11.75	12.73	13.71	14.69	15.67	20.58	35.29	59.81	84.34	108.86
30%	10.77	12.24	13.71	15.18	16.65	18.12	25.48	47.55	84.34	121.13	157.91
40%	10.77	12.73	14.69	16.65	18.61	20.58	30.39	59.81	108.86	157.91	206.96
50%	10.77	13.22	15.67	18.12	20.58	23.03	35.29	72.08	133.39	194.70	256.01
60%	10.77	13.71	16.65	19.59	22.54	25.48	40.19	84.34	157.91	231.49	305.06
70%	10.77	14.20	17.63	21.07	24.50	27.93	45.10	96.60	182.44	268.27	354.11
80%	10.77	14.69	18.61	22.54	26.46	30.39	50.00	108.86	206.96	305.06	403.16
90%	10.77	15.18	19.59	24.01	28.42	32.84	54.91	121.13	231.49	341.84	452.20
100%	10.77	15.67	20.58	25.48	30.39	35.29	59.81	133.39	256.01	378.63	501.25

Table 1.38: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Cape Wrath SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%
	1%	0.36%	0.36%	0.36%	0.36%	0.36%	0.36%	0.37%	0.40%	0.44%	0.48%	0.52%
	5%	0.36%	0.36%	0.37%	0.38%	0.39%	0.40%	0.44%	0.56%	0.76%	0.97%	1.17%
	10%	0.36%	0.37%	0.39%	0.41%	0.42%	0.44%	0.52%	0.76%	1.17%	1.57%	1.98%
	20%	0.36%	0.39%	0.42%	0.45%	0.49%	0.52%	0.68%	1.17%	1.98%	2.79%	3.60%
	30%	0.36%	0.41%	0.45%	0.50%	0.55%	0.60%	0.84%	1.57%	2.79%	4.01%	5.23%
	40%	0.36%	0.42%	0.49%	0.55%	0.62%	0.68%	1.01%	1.98%	3.60%	5.23%	6.85%
	50%	0.36%	0.44%	0.52%	0.60%	0.68%	0.76%	1.17%	2.39%	4.42%	6.45%	8.48%
	60%	0.36%	0.45%	0.55%	0.65%	0.75%	0.84%	1.33%	2.79%	5.23%	7.67%	10.10%
	70%	0.36%	0.47%	0.58%	0.70%	0.81%	0.92%	1.49%	3.20%	6.04%	8.88%	11.73%
	80%	0.36%	0.49%	0.62%	0.75%	0.88%	1.01%	1.66%	3.60%	6.85%	10.10%	13.35%
	90%	0.36%	0.50%	0.65%	0.79%	0.94%	1.09%	1.82%	4.01%	7.67%	11.32%	14.97%
	100%	0.36%	0.52%	0.68%	0.84%	1.01%	1.17%	1.98%	4.42%	8.48%	12.54%	16.60%

North Colonsay and Western Cliffs SPA

1.4.3.19 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from North Colonsay and Western Cliffs SPA, an in-combination assessment is presented within Table 1.39 (30-70% displacement and 1-10% mortality plus collisions).

Table 1.39: In-combination assessment for black-legged kittiwake from the North Colonsay and Western Cliffs SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.0237	No connectivity	0.0134	0.01 to 0.27	-	0.00 to 0.04	0.27	-	0.04	0.21 to 0.47	-	0.06 to 0.10	0.27 to 0.57
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0237	No connectivity	0.0134	0.00 to 0.05	-	0.00 to 0.02	0.05	-	0.02	0.00 to 0.05	-	0.00 to 0.02	0.00 to 0.07
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.0237	No connectivity	0.0134	0.08 to 1.82	-	0.01 to 0.26	1.82	-	0.26	0.24 to 1.98	-	0.19 to 0.44	0.43 to 2.43
Llŷr 1 Floating Offshore Wind Farm	112	68	1,064	1.17	0.88	11.60	0.0237	No connectivity	0.0134	0.01 to 0.19	-	0.04 to 1.00	0.19	-	1.00	0.04 to 0.21	-	0.20 to 1.15	0.23 to 1.37
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0237	No connectivity	0.0134	0.00 to 0.05	-	0.00 to 0.10	0.05	-	0.10	0.00 to 0.05	-	0.00 to 0.10	0.01 to 0.15
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.0237	No connectivity	0.0134	0.02 to 0.52	-	0.01 to 0.29	0.52	-	0.29	0.13 to 0.63	-	0.07 to 0.35	0.21 to 0.98
Morecambe Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0237	No connectivity	0.0134	0.00 to 0.07	-	0.04 to 0.88	0.07	-	0.88	0.01 to 0.08	-	0.10 to 0.94	0.11 to 1.02
Morgan Generation Assets	430	425	630	2.88	13.79	10.02	0.0237	No connectivity	0.0134	0.03 to 0.71	-	0.03 to 0.59	0.71	-	0.59	0.10 to 0.78	-	0.16 to 0.73	0.26 to 1.51
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0237	No connectivity	0.0134	0.00 to 0.02	-	0.00 to 0.01	0.02	-	0.01	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.03
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.0237	No connectivity	0.0134	0.03 to 0.75	-	0.00 to 0.11	0.75	-	0.11	0.57 to 1.29	-	0.12 to 0.23	0.69 to 1.52
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.0237	No connectivity	0.0134	0.01 to 0.26	-	0.00 to 0.05	0.26	-	0.05	0.23 to 0.48	-	0.08 to 0.12	0.31 to 0.60
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.0237	No connectivity	0.0134	0.06 to 1.32	-	0.02 to 0.57	1.32	-	0.57	0.25 to 1.52	-	0.66 to 1.21	0.91 to 2.72
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.0237	No connectivity	0.0134	0.05 to 1.10	-	0.02 to 0.41	1.10	-	0.41	0.32 to 1.37	-	0.14 to 0.53	0.46 to 1.90
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.0237	No connectivity	0.0134	0.03 to 0.63	-	0.00 to 0.09	0.63	-	0.09	0.15 to 0.75	-	0.02 to 0.10	0.16 to 0.85

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0237	No connectivity	0.0134	0.00 to 0.02	-	0.00 to 0.01	0.02	-	0.01	0.01 to 0.03	-	0.01 to 0.02	0.02 to 0.05
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0237	No connectivity	0.0134	0.00 to 0.02	-	0.00 to 0.01	0.02	-	0.01	0.01 to 0.03	-	0.01 to 0.02	0.01 to 0.04
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0237	No connectivity	0.0134	0.00 to 0.06	-	0.00 to 0.03	0.06	-	0.03	0.01 to 0.08	-	0.01 to 0.04	0.02 to 0.12
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0237	No connectivity	0.0134	0.00 to 0.02	-	0.00 to 0.01	0.02	-	0.01	0.01 to 0.03	-	0.01 to 0.02	0.02 to 0.05
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0237	No connectivity	0.0134	0.00 to 0.03	-	0.00 to 0.01	0.03	-	0.01	0.01 to 0.04	-	0.01 to 0.02	0.02 to 0.06
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0237	No connectivity	0.0134	0.00 to 0.02	-	0.00 to 0.01	0.02	-	0.01	0.01 to 0.03	-	0.01 to 0.02	0.02 to 0.05
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0237	No connectivity	0.0134	0.00 to 0.05	-	0.00 to 0.03	0.05	-	0.03	0.02 to 0.06	-	0.01 to 0.04	0.03 to 0.10
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.044	No connectivity	0.0237	0.00 to 0.04	-	0.00 to 0.02	0.04	-	0.02	0.01 to 0.04	-	0.01 to 0.02	0.01 to 0.07
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0237	No connectivity	0.0134	0.00 to 0.06	-	0.00 to 0.03	0.06	-	0.03	0.04 to 0.09	-	0.03 to 0.06	0.07 to 0.16
Total predicted impact (adult birds)										**0.35 to 8.06**	**-**	**0.20 to 4.59**	**8.06**	**-**	**4.59**	**2.37 to 10.09**	**-**	**1.91 to 6.30**	**4.28 to 16.39**
Increase in baseline mortality (%)										**0.01% to 0.50%**	**-**	**0.01% to 0.28%**	**0.50%**	**-**	**0.28%**	**0.08% to 0.62%**	**-**	**0.06% to 0.39%**	**0.14% to 1.01%**

1.4.3.20 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from North Colonsay SPA, one (Table 1.40) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.41) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.40: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the North Colonsay SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74
	1%	3.74	3.75	3.77	3.79	3.81	3.83	3.92	4.19	4.64	5.09	5.54
	5%	3.74	3.83	3.92	4.01	4.10	4.19	4.64	6.00	8.26	10.51	12.77

10%	3.74	3.92	4.10	4.28	4.46	4.64	5.54	8.26	12.77	17.29	21.81
20%	3.74	4.10	4.46	4.82	5.18	5.54	7.35	12.77	21.81	30.85	39.89
30%	3.74	4.28	4.82	5.36	5.91	6.45	9.16	17.29	30.85	44.41	57.97
40%	3.74	4.46	5.18	5.91	6.63	7.35	10.97	21.81	39.89	57.97	76.04
50%	3.74	4.64	5.54	6.45	7.35	8.26	12.77	26.33	48.93	71.52	94.12
60%	3.74	4.82	5.91	6.99	8.07	9.16	14.58	30.85	57.97	85.08	112.20
70%	3.74	5.00	6.27	7.53	8.80	10.06	16.39	35.37	67.00	98.64	130.27
80%	3.74	5.18	6.63	8.07	9.52	10.97	18.20	39.89	76.04	112.20	148.35
90%	3.74	5.36	6.99	8.62	10.24	11.87	20.00	44.41	85.08	125.75	166.43
100%	3.74	5.54	7.35	9.16	10.97	12.77	21.81	48.93	94.12	139.31	184.50

Table 1.41: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the North Colonsay SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)	Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%) 0%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%
1%	0.23%	0.23%	0.23%	0.23%	0.23%	0.24%	0.24%	0.26%	0.29%	0.31%	0.34%
5%	0.23%	0.24%	0.24%	0.25%	0.25%	0.26%	0.29%	0.37%	0.51%	0.65%	0.79%
10%	0.23%	0.24%	0.25%	0.26%	0.27%	0.29%	0.34%	0.51%	0.79%	1.06%	1.34%
20%	0.23%	0.25%	0.27%	0.30%	0.32%	0.34%	0.45%	0.79%	1.34%	1.90%	2.46%
30%	0.23%	0.26%	0.30%	0.33%	0.36%	0.40%	0.56%	1.06%	1.90%	2.73%	3.57%
40%	0.23%	0.27%	0.32%	0.36%	0.41%	0.45%	0.68%	1.34%	2.46%	3.57%	4.68%
50%	0.23%	0.29%	0.34%	0.40%	0.45%	0.51%	0.79%	1.62%	3.01%	4.40%	5.80%
60%	0.23%	0.30%	0.36%	0.43%	0.50%	0.56%	0.90%	1.90%	3.57%	5.24%	6.91%
70%	0.23%	0.31%	0.39%	0.46%	0.54%	0.62%	1.01%	2.18%	4.13%	6.07%	8.02%
80%	0.23%	0.32%	0.41%	0.50%	0.59%	0.68%	1.12%	2.46%	4.68%	6.91%	9.13%
90%	0.23%	0.33%	0.43%	0.53%	0.63%	0.73%	1.23%	2.73%	5.24%	7.74%	10.25%
100%	0.23%	0.34%	0.45%	0.56%	0.68%	0.79%	1.34%	3.01%	5.80%	8.58%	11.36%

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.4.3.21 As the combined displacement and collision impact and collision only impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, an in-combination assessment is presented within Table 1.42 (30% displacement and 1% mortality to 70% displacement and 10% mortality plus collisions).

Table 1.42: In-combination assessment for black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA – when considering 30-70% displacement and 1-10% mortality.

a – During the breeding season site-specific age-class values have been used for Erebus Floating Wind Project (100%), Llŷr Floating Offshore Wind Project (77.39%), Mona Offshore Wind Project (95.36%), Morecambe Generation Assets (96.5%) and Morgan Generation Assets (84.11%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 54.33% of birds are adults in the pre-breeding period and 54.74% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.004.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.004.

e - the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.636.

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	162	87	45	8.31	11.66	4.54	0.0045	0.004 [b]	0.0025	0.00 to 0.05	0.00 to 0.02	0.00 to 0.01	0.04	0.05	0.01	0.04 to 0.09	0.05 to 0.07	0.01 to 0.02	0.10 to 0.18
Burbo Bank Extension Offshore Wind Farm	27	707	25	0.00	23.04	0.00	0.0045	0.004 [d]	0.0025	0.00 to 0.01	0.01 to 0.20	0.00 to 0.00	0.00	0.09	0.00	0.00 to 0.01	0.10 to 0.29	0.00 to 0.00	0.10 to 0.30
Erebus Floating Wind Demo	1,099	2	278	6.80	0.50	13.49	0.0045	0.817 [b]	0.0025	0.01 to 0.35	0.00 to 0.11	0.00 to 0.05	0.03	0.41	0.03	0.05 to 0.38	0.41 to 0.52	0.04 to 0.08	0.49 to 0.98
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	112	68	1,064	1.17	0.88	11.60	0.0045	0.636 [b]	0.0025	0.00 to 0.04	0.13 to 3.03	0.01 to 0.19	0.01	0.54	0.03	0.01 to 0.04	0.67 to 3.57	0.04 to 0.21	0.71 to 3.83
TwinHub (Wave Hub Floating Wind Farm)	30	4	103	0.00	9.72	0.00	0.0045	0.636 [e]	0.0025	0.00 to 0.01	0.01 to 0.18	0.00 to 0.02	0.00	6.18	0.00	0.00 to 0.01	6.19 to 6.36	0.00 to 0.02	6.19 to 6.39
Mona Offshore Wind Project	312	692	307	4.75	14.80	4.60	0.0045	0.002 [b]	0.0025	0.00 to 0.10	0.00 to 0.10	0.00 to 0.05	0.02	0.03	0.01	0.03 to 0.12	0.03 to 0.13	0.01 to 0.07	0.07 to 0.31
Morecambe Generation Assets	41	1,668	940	0.34	15.75	4.65	0.0045	0.003 [b]	0.0025	0.00 to 0.01	0.02 to 0.35	0.01 to 0.16	0.00	0.05	0.01	0.00 to 0.01	0.06 to 0.40	0.02 to 0.18	0.08 to 0.59
Morgan Generation Assets	430	425	630	2.88	13.79	10.02	0.0045	0.002 [b]	0.0025	0.01 to 0.14	0.00 to 0.06	0.00 to 0.11	0.01	0.03	0.03	0.02 to 0.15	0.03 to 0.09	0.03 to 0.14	0.08 to 0.37
Ormonde Wind Farm	12	60	11	0.00	3.27	0.00	0.0045	0.002 [c]	0.0025	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Rampion Offshore Wind Farm	451	1,059	122	22.69	70.56	8.67	0.0045	No connectivity	0.0025	0.01 to 0.14	-	0.00 to 0.02	0.10	-	0.02	0.11 to 0.24	-	0.02 to 0.04	0.13 to 0.29
Rampion 2 Offshore Wind Farm	155	5	53	9.24	1.00	5.47	0.0045	No connectivity	0.0025	0.00 to 0.05	-	0.00 to 0.01	0.04	-	0.01	0.04 to 0.09	-	0.01 to 0.02	0.06 to 0.11
Walney (3 and 4) Extension Offshore Wind Farm	797	319	610	8.25	18.79	47.30	0.0045	0.002 [c]	0.0025	0.01 to 0.25	0.00 to 0.04	0.00 to 0.11	0.04	0.04	0.12	0.05 to 0.29	0.04 to 0.08	0.12 to 0.22	0.21 to 0.60
West of Orkney Windfarm	661	690	437	11.40	17.06	9.00	0.0045	No connectivity	0.0025	0.01 to 0.21	-	0.00 to 0.08	0.05	-	0.02	0.06 to 0.26	-	0.03 to 0.10	0.09 to 0.36

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30% displacement and 1% mortality to 70% displacement and 10% mortality)			Apportioned collision values (species-group avoidance rate 99.28)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
White Cross Offshore Windfarm	379	44	94	5.03	3.70	1.01	0.0045	0.636 [e]	0.0025	0.01 to 0.12	0.08 to 1.96	0.00 to 0.02	0.02	2.35	0.00	0.03 to 0.14	2.44 to 4.31	0.00 to 0.02	2.47 to 4.47
Gap-filled projects																			
Barrow Offshore Wind Farm	12	20	11	0.34	1.19	0.44	0.0045	0.002 [c]	0.0025	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.01
Burbo Bank	12	14	11	0.29	0.84	0.46	0.0045	0.004 [d]	0.0025	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.02
Gwynt Y Môr Offshore Wind Farm	39	51	36	0.46	1.45	0.73	0.0045	0.004 [d]	0.0025	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.02	0.00 to 0.01	0.01 to 0.04
North Hoyle Offshore Wind Farm	11	17	10	0.42	1.47	0.54	0.0045	0.004 [d]	0.0025	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Robin Rigg Offshore Wind Farm	16	21	15	0.40	1.33	0.70	0.0045	0.002 [c]	0.0025	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.01 to 0.02
Rhyl Flats Offshore Wind Farm	12	16	11	0.41	1.34	0.65	0.0045	0.004 [d]	0.0025	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
Walney 1 Offshore Wind Farm	30	37	27	0.63	1.81	1.02	0.0045	0.002 [c]	0.0025	0.00 to 0.01	0.00 to 0.01	0.00 to 0.00	0.00	0.00	0.00	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.01 to 0.03
Walney 2 Offshore Wind Farm	21	26	19	0.30	3.26	0.39	0.0045	0.002 [c]	0.0025	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.01	0.01 to 0.01	0.00 to 0.00	0.01 to 0.02
West of Duddon Sands Offshore Wind Farm	37	454	34	1.41	3.99	2.28	0.0045	0.002 [c]	0.0025	0.00 to 0.01	0.00 to 0.06	0.00 to 0.01	0.01	0.01	0.01	0.01 to 0.02	0.01 to 0.07	0.01 to 0.01	0.02 to 0.10
Total predicted impact (adult birds)										**0.07 to 1.53**	**0.26 to 6.17**	**0.04 to 0.86**	**0.38**	**9.82**	**0.32**	**0.45 to 1.92**	**10.08 to 15.99**	**0.35 to 1.17**	**10.89 to 19.08**
Increase in baseline mortality (%)										**0.01% to 0.33%**	**0.06% to 1.34%**	**0.01% to 0.19%**	**0.08%**	**2.14%**	**0.07%**	**0.10% to 0.42%**	**2.20% to 3.48%**	**0.08% to 0.26%**	**2.37% to 4.16%**

1.4.3.22 Two matrix tables are presented to indicate the varying potential impacts on black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, one (Table 1.43) showing the number of adult birds impacted at a variety of displacement and mortality rates (0-100%) and one (Table 1.44) indicating the percentage increase in baseline mortality. The colours used within the matrix table are to highlight the different SNCB advice with respect to the consideration of predicted impacts for black-legged kittiwake. Cells highlighted purple show collisions only, which is the only impact scenario NRW (A) and Natural England advises should be assessed for black-legged kittiwake. The blue highlighted cells represent collisions plus displacement impacts for the full range of scenarios advised by the JNCC (1-10% mortality and 30-70% displacement) and the blue cells bordered by the yellow line represent NatureScot's approach (1-3% mortality and 30% displacement). The green cells represents the Applicant's approach, used within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) and Volume 2, Chapter 5: Offshore Ornithology (F2.5 F04). Cells within Table 1.20 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.2).

Table 1.43: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Black-legged kittiwake (Annual – number of adults)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52
	1%	10.52	10.53	10.54	10.56	10.57	10.58	10.64	10.82	11.13	11.44	11.74
	5%	10.52	10.58	10.64	10.70	10.76	10.82	11.13	12.05	13.58	15.10	16.63
	10%	10.52	10.64	10.76	10.89	11.01	11.13	11.74	13.58	16.63	19.69	22.75
	20%	10.52	10.76	11.01	11.25	11.50	11.74	12.96	16.63	22.75	28.86	34.97
	30%	10.52	10.89	11.25	11.62	11.99	12.35	14.19	19.69	28.86	38.03	47.20
	40%	10.52	11.01	11.50	11.99	12.47	12.96	15.41	22.75	34.97	47.20	59.42
	50%	10.52	11.13	11.74	12.35	12.96	13.58	16.63	25.80	41.08	56.37	71.65
	60%	10.52	11.25	11.99	12.72	13.45	14.19	17.85	28.86	47.20	65.54	83.88
	70%	10.52	11.37	12.23	13.09	13.94	14.80	19.08	31.91	53.31	74.71	96.10
	80%	10.52	11.50	12.47	13.45	14.43	15.41	20.30	34.97	59.42	83.88	108.33
	90%	10.52	11.62	12.72	13.82	14.92	16.02	21.52	38.03	65.54	93.05	120.56
	100%	10.52	11.74	12.96	14.19	15.41	16.63	22.75	41.08	71.65	102.22	132.78

Table 1.44: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on black-legged kittiwake from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Black-legged kittiwake (Annual- increase in baseline mortality)		Mortality rate (%) 0% (collisions only)	1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	0%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%	2.29%
	1%	2.29%	2.29%	2.30%	2.30%	2.30%	2.30%	2.32%	2.36%	2.42%	2.49%	2.56%
	5%	2.29%	2.30%	2.32%	2.33%	2.34%	2.36%	2.42%	2.62%	2.96%	3.29%	3.62%
	10%	2.29%	2.32%	2.34%	2.37%	2.40%	2.42%	2.56%	2.96%	3.62%	4.29%	4.96%
	20%	2.29%	2.34%	2.40%	2.45%	2.50%	2.56%	2.82%	3.62%	4.96%	6.29%	7.62%
	30%	2.29%	2.37%	2.45%	2.53%	2.61%	2.69%	3.09%	4.29%	6.29%	8.28%	10.28%
	40%	2.29%	2.40%	2.50%	2.61%	2.72%	2.82%	3.36%	4.96%	7.62%	10.28%	12.95%
	50%	2.29%	2.42%	2.56%	2.69%	2.82%	2.96%	3.62%	5.62%	8.95%	12.28%	15.61%
	60%	2.29%	2.45%	2.61%	2.77%	2.93%	3.09%	3.89%	6.29%	10.28%	14.28%	18.27%
	70%	2.29%	2.48%	2.66%	2.85%	3.04%	3.22%	4.16%	6.95%	11.61%	16.28%	20.94%
	80%	2.29%	2.50%	2.72%	2.93%	3.14%	3.36%	4.42%	7.62%	12.95%	18.27%	23.60%
	90%	2.29%	2.53%	2.77%	3.01%	3.25%	3.49%	4.69%	8.28%	14.28%	20.27%	26.26%
	100%	2.29%	2.56%	2.82%	3.09%	3.36%	3.62%	4.96%	8.95%	15.61%	22.27%	28.93%

Common guillemot

Sule Skerry and Sule Stack SPA

1.4.3.23 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Sule Skerry and Sule Stack SPA, an in-combination assessment is presented within Table 1.45 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality).

Table 1.45: In-combination assessment for common guillemot from the Sule Skerry and Sule Stack SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0221	0.11 to 2.60	-	0.11 to 2.60	0.52	-	0.52
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0221	0.06 to 1.39	-	0.06 to 1.39	0.28	-	0.28
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0221	1.08 to 25.25	-	1.08 to 25.25	5.05	-	5.05
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0221	0.50 to 11.59	-	0.50 to 11.59	2.32	-	2.32
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0221	0.01 to 0.19	-	0.01 to 0.19	0.04	-	0.04
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0221	0.07 to 1.72	-	0.07 to 1.72	0.34	-	0.34
West of Orkney Windfarm	2,794	4,275	0.9145 [b]	0.0221	13.50 to 314.99	13.34 to 311.18	0.16 to 3.81	63.00	62.24	0.76
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0221	0.04 to 0.94	-	0.04 to 0.94	0.19	-	0.19
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0221	0.32 to 7.41	-	0.32 to 7.41	1.48	-	1.48
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0221	0.15 to 3.41	-	0.15 to 3.41	0.68	-	0.68
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0221	0.14 to 3.35	-	0.14 to 3.35	0.67	-	0.67
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0221	0.00 to 0.06	-	0.00 to 0.06	0.01	-	0.01
Burbo Bank	No connectivity	33	No connectivity	0.0221	0.00 to 0.05	-	0.00 to 0.05	0.01	-	0.01
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0221	0.01 to 0.18	-	0.01 to 0.18	0.04	-	0.04
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0221	0.00 to 0.06	-	0.00 to 0.06	0.01	-	0.01
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0221	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0221	0.00 to 0.08	-	0.00 to 0.08	0.02	-	0.02
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0221	0.00 to 0.06	-	0.00 to 0.06	0.01	-	0.01
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0221	0.01 to 0.20	-	0.01 to 0.20	0.04	-	0.04
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0221	0.01 to 0.15	-	0.01 to 0.15	0.03	-	0.03
Total predicted impact (adult birds)					**16.02 to 373.71**	**13.34 to 311.18**	**2.68 to 62.53**	**74.74**	**62.24**	**12.51**
Increase in baseline mortality (%)					**1.72% to 40.14%**	**1.43% to 33.42%**	**0.29% to 6.72%**	**8.03%**	**6.68%**	**1.34%**

1.4.3.24 As the predicted impact on common guillemot from Sule Skerry and Sule Stack SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.5.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.25 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Sule Skerry and Sule Stack SPA, one (Table 1.46) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.47) indicating the percentage increase in baseline mortality The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.47 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.46: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Sule Skerry and Sule Stack SPA.

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	**2%**	**3%**	**4%**	**5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**75%**	**100%**
1%	1	1	2	2	3	5	11	16	21	27	40	53
5%	3	5	8	11	13	27	53	80	107	133	200	267
10%	5	11	16	21	27	53	107	160	214	267	400	534
20%	11	21	32	43	53	107	214	320	427	534	801	1,068
30%	16	32	48	64	80	160	320	480	641	801	1,201	1,602
40%	21	43	64	85	107	214	427	641	854	1,068	1,602	2,135
50%	27	53	80	107	133	267	534	801	1,068	1,335	2,002	2,669
60%	32	64	96	128	160	320	641	961	1,281	1,602	2,402	3,203
70%	37	75	112	149	187	374	747	1,121	1,495	1,869	2,803	3,737
80%	43	85	128	171	214	427	854	1,281	1,708	2,135	3,203	4,271
90%	48	96	144	192	240	480	961	1,441	1,922	2,402	3,604	4,805
100%	53	107	160	214	267	534	1,068	1,602	2,135	2,669	4,004	5,339

Table 1.47: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Sule Skerry and Sule Stack SPA (red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.06%	0.11%	0.17%	0.23%	0.29%	0.57%	1.15%	1.72%	2.29%	2.87%	4.30%	5.73%
5%	0.29%	0.57%	0.86%	1.15%	1.43%	2.87%	5.73%	8.60%	11.47%	14.34%	21.50%	28.67%
10%	0.57%	1.15%	1.72%	2.29%	2.87%	5.73%	11.47%	17.20%	22.94%	28.67%	43.01%	57.34%
20%	1.15%	2.29%	3.44%	4.59%	5.73%	11.47%	22.94%	34.41%	45.87%	57.34%	86.01%	114.69%
30%	1.72%	3.44%	5.16%	6.88%	8.60%	17.20%	34.41%	51.61%	68.81%	86.01%	129.02%	172.03%
40%	2.29%	4.59%	6.88%	9.17%	11.47%	22.94%	45.87%	68.81%	91.75%	114.69%	172.03%	229.37%
50%	2.87%	5.73%	8.60%	11.47%	14.34%	28.67%	57.34%	86.01%	114.69%	143.36%	215.04%	286.72%
60%	3.44%	6.88%	10.32%	13.76%	17.20%	34.41%	68.81%	103.22%	137.62%	172.03%	258.04%	344.06%
70%	4.01%	8.03%	12.04%	16.06%	20.07%	40.14%	80.28%	120.42%	160.56%	200.70%	301.05%	401.40%
80%	4.59%	9.17%	13.76%	18.35%	22.94%	45.87%	91.75%	137.62%	183.50%	229.37%	344.06%	458.75%
90%	5.16%	10.32%	15.48%	20.64%	25.80%	51.61%	103.22%	154.83%	206.44%	258.04%	387.07%	516.09%
100%	5.73%	11.47%	17.20%	22.94%	28.67%	57.34%	114.69%	172.03%	229.37%	286.72%	430.07%	573.43%

North Rona and Sula Sgeir SPA

1.4.3.26 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot North Rona and Sula Sgeir SPA, an in-combination assessment is presented within Table 1.48 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.48: In-combination assessment for common guillemot from the North Rona and Sula Sgeir SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0145	0.07 to 1.71	-	0.07 to 1.71	0.34	-	0.34
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0145	0.04 to 0.91	-	0.04 to 0.91	0.18	-	0.18
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0145	0.71 to 16.57	-	0.71 to 16.57	3.31	-	3.31
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0145	0.33 to 7.61	-	0.33 to 7.61	1.52	-	1.52
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0145	0.01 to 0.13	-	0.01 to 0.13	0.03	-	0.03
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0145	0.05 to 1.13	-	0.05 to 1.13	0.23	-	0.23
West of Orkney Windfarm	2,794	2,462	0.0002[b]	0.0145	0.11 to 2.54	0.00 to 0.04	0.11 to 2.50	0.51	0.01	0.50
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0145	0.03 to 0.62	-	0.03 to 0.62	0.12	-	0.12

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0145	0.21 to 4.86	-	0.21 to 4.86	0.97	-	0.97
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0145	0.10 to 2.24	-	0.10 to 2.24	0.45	-	0.45
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0145	0.09 to 2.20	-	0.09 to 2.20	0.44	-	0.44
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0145	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Burbo Bank	No connectivity	33	No connectivity	0.0145	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0145	0.01 to 0.12	-	0.01 to 0.12	0.02	-	0.02
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0145	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0145	0.00 to 0.02	-	0.00 to 0.02	0.00	-	0.00
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0145	0.00 to 0.05	-	0.00 to 0.05	0.01	-	0.01
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0145	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0145	0.01 to 0.13	-	0.01 to 0.13	0.03	-	0.03
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0145	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Total predicted impact (adult birds)					**1.76 to 41.06**	**0.00 to 0.04**	**1.76 to 41.06**	**8.21**	**0.01**	**8.21**
Increase in baseline mortality (%)					**0.29% to 6.73%**	**0.00% to 0.01%**	**0.29% to 6.73%**	**1.35%**	**0.00%**	**1.35%**

1.4.3.27 As the predicted impact on common guillemot from North Rona and Sula Sgeir SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.28 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from North Rona and Sula Sgeir SPA, one (Table 1.49) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.50) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.50 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.49: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the North Rona and Sula Sgeir SPA.

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	1	1	2	2	3	4	6
5%	0	1	1	1	1	3	6	9	12	15	22	29
10%	1	1	2	2	3	6	12	18	23	29	44	59
20%	1	2	4	5	6	12	23	35	47	59	88	117
30%	2	4	5	7	9	18	35	53	70	88	132	176
40%	2	5	7	9	12	23	47	70	94	117	176	235
50%	3	6	9	12	15	29	59	88	117	147	220	294

	60%	4	7	11	14	18	35	70	106	141	176	264	352
	70%	4	8	12	16	21	41	82	123	164	205	308	411
	80%	5	9	14	19	23	47	94	141	188	235	352	470
	90%	5	11	16	21	26	53	106	159	211	264	396	528
	100%	6	12	18	23	29	59	117	176	235	294	440	587

Table 1.50: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the North Rona and Sula Sgeir SPA (red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)												
		1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
	1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.38%	0.48%	0.72%	0.96%
	5%	0.05%	0.10%	0.14%	0.19%	0.24%	0.48%	0.96%	1.44%	1.92%	2.41%	3.61%	4.81%
	10%	0.10%	0.19%	0.29%	0.38%	0.48%	0.96%	1.92%	2.89%	3.85%	4.81%	7.22%	9.62%
	20%	0.19%	0.38%	0.58%	0.77%	0.96%	1.92%	3.85%	5.77%	7.70%	9.62%	14.44%	19.25%
	30%	0.29%	0.58%	0.87%	1.15%	1.44%	2.89%	5.77%	8.66%	11.55%	14.44%	21.65%	28.87%
	40%	0.38%	0.77%	1.15%	1.54%	1.92%	3.85%	7.70%	11.55%	15.40%	19.25%	28.87%	38.50%
	50%	0.48%	0.96%	1.44%	1.92%	2.41%	4.81%	9.62%	14.44%	19.25%	24.06%	36.09%	48.12%
	60%	0.58%	1.15%	1.73%	2.31%	2.89%	5.77%	11.55%	17.32%	23.10%	28.87%	43.31%	57.74%
	70%	0.67%	1.35%	2.02%	2.69%	3.37%	6.74%	13.47%	20.21%	26.95%	33.68%	50.52%	67.37%
	80%	0.77%	1.54%	2.31%	3.08%	3.85%	7.70%	15.40%	23.10%	30.80%	38.50%	57.74%	76.99%
	90%	0.87%	1.73%	2.60%	3.46%	4.33%	8.66%	17.32%	25.98%	34.65%	43.31%	64.96%	86.61%
	100%	0.96%	1.92%	2.89%	3.85%	4.81%	9.62%	19.25%	28.87%	38.50%	48.12%	72.18%	96.24%

Cape Wrath SPA

1.4.3.29 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Cape Wrath SPA, an in-combination assessment is presented within Table 1.51 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.51: In-combination assessment for common guillemot from the Cape Wrath SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0792	0.40 to 9.32	-	0.40 to 9.32	1.86	-	1.86
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0792	0.21 to 4.98	-	0.21 to 4.98	1.00	-	1.00
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0792	3.88 to 90.49	-	3.88 to 90.49	18.10	-	18.10
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0792	1.78 to 41.54	-	1.78 to 41.54	8.31	-	8.31
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0792	0.03 to 0.69	-	0.03 to 0.69	0.14	-	0.14

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0792	0.26 to 6.15	-	0.26 to 6.15	1.23	-	1.23
West of Orkney Windfarm	2,794	2,462	0.0248[b]	0.0792	0.79 to 18.50	0.21 to 4.85	0.59 to 13.65	3.70	0.97	2.73
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0792	0.14 to 3.38	-	0.14 to 3.38	0.68	-	0.68
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0792	1.14 to 26.55	-	1.14 to 26.55	5.31	-	5.31
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0792	0.52 to 12.21	-	0.52 to 12.21	2.44	-	2.44
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0792	0.51 to 11.99	-	0.51 to 11.99	2.40	-	2.40
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0792	0.01 to 0.20	-	0.01 to 0.20	0.04	-	0.04
Burbo Bank	No connectivity	33	No connectivity	0.0792	0.01 to 0.19	-	0.01 to 0.19	0.04	-	0.04
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0792	0.03 to 0.65	-	0.03 to 0.65	0.13	-	0.13
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0792	0.01 to 0.20	-	0.01 to 0.20	0.04	-	0.04
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0792	0.01 to 0.12	-	0.01 to 0.12	0.02	-	0.02
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0792	0.01 to 0.28	-	0.01 to 0.28	0.06	-	0.06
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0792	0.01 to 0.22	-	0.01 to 0.22	0.04	-	0.04
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0792	0.03 to 0.72	-	0.03 to 0.72	0.14	-	0.14
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0792	0.02 to 0.53	-	0.02 to 0.53	0.11	-	0.11
Total predicted impact (adult birds)					**9.81 to 228.93**	**0.21 to 4.85**	**9.60 to 224.08**	**45.79**	**0.97**	**44.82**
Increase in baseline mortality (%)					**0.29% to 6.86%**	**0.01% to 0.15%**	**0.29% to 6.71%**	**1.37%**	**0.03%**	**1.34%**

1.4.3.30 As the predicted impact on common guillemot from Cape Wrath SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to conclude whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.31 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Cape Wrath SPA, one (Table 1.52) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.53) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.53 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.52: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Cape Wrath SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	1	1	1	2	3	7	10	13	17	25	33
5%	2	3	5	7	8	17	33	50	66	83	125	166
10%	3	7	10	13	17	33	66	100	133	166	249	332
20%	7	13	20	27	33	66	133	199	266	332	498	664
30%	10	20	30	40	50	100	199	299	399	498	747	997
40%	13	27	40	53	66	133	266	399	531	664	997	1,329
50%	17	33	50	66	83	166	332	498	664	830	1,246	1,661

	60%	20	40	60	80	100	199	399	598	797	997	1,495	1,993
	70%	23	47	70	93	116	233	465	698	930	1,163	1,744	2,325
	80%	27	53	80	106	133	266	531	797	1,063	1,329	1,993	2,657
	90%	30	60	90	120	149	299	598	897	1,196	1,495	2,242	2,990
	100%	33	66	100	133	166	332	664	997	1,329	1,661	2,491	3,322

Table 1.53: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Cape Wrath SPA (red text indicates >1%).

	Mortality level (% of displaced birds at risk of mortality)												
Displacement level (% at risk of displacement)		**1%**	**2%**	**3%**	**4%**	**5%**	**10%**	**20%**	**30%**	**40%**	**50%**	**75%**	**100%**
	1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.20%	0.30%	0.40%	0.50%	0.75%	1.00%
	5%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.00%	1.49%	1.99%	2.49%	3.73%	4.98%
	10%	0.10%	0.20%	0.30%	0.40%	0.50%	1.00%	1.99%	2.99%	3.98%	4.98%	7.46%	9.95%
	20%	0.20%	0.40%	0.60%	0.80%	1.00%	1.99%	3.98%	5.97%	7.96%	9.95%	14.93%	19.90%
	30%	0.30%	0.60%	0.90%	1.19%	1.49%	2.99%	5.97%	8.96%	11.94%	14.93%	22.39%	29.85%
	40%	0.40%	0.80%	1.19%	1.59%	1.99%	3.98%	7.96%	11.94%	15.92%	19.90%	29.85%	39.81%
	50%	0.50%	1.00%	1.49%	1.99%	2.49%	4.98%	9.95%	14.93%	19.90%	24.88%	37.32%	49.76%
	60%	0.60%	1.19%	1.79%	2.39%	2.99%	5.97%	11.94%	17.91%	23.88%	29.85%	44.78%	59.71%
	70%	0.70%	1.39%	2.09%	2.79%	3.48%	6.97%	13.93%	20.90%	27.86%	34.83%	52.24%	69.66%
	80%	0.80%	1.59%	2.39%	3.18%	3.98%	7.96%	15.92%	23.88%	31.84%	39.81%	59.71%	79.61%
	90%	0.90%	1.79%	2.69%	3.58%	4.48%	8.96%	17.91%	26.87%	35.82%	44.78%	67.17%	89.56%
	100%	1.00%	1.99%	2.99%	3.98%	4.98%	9.95%	19.90%	29.85%	39.81%	49.76%	74.64%	99.51%

Handa SPA

1.4.3.32 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Handa SPA, an in-combination assessment is presented within Table 1.54 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.54: In-combination assessment for common guillemot from the Handa SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.11	0.55 to 12.95	-	0.55 to 12.95	2.59	-	2.59
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.11	0.30 to 6.92	-	0.30 to 6.92	1.38	-	1.38
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.11	5.37 to 125.68	-	5.37 to 125.68	25.14	-	25.14
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.11	2.47 to 57.69	-	2.47 to 57.69	11.54	-	11.54
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.11	0.04 to 0.96	-	0.04 to 0.96	0.19	-	0.19
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.11	0.37 to 8.55	-	0.37 to 8.55	1.71	-	1.71
West of Orkney Windfarm	2,794	2,462	0.0116[b]	0.11	0.91 to 21.23	0.10 to 2.27	0.81 to 18.96	4.25	0.45	3.79
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.11	0.20 to 4.70	-	0.20 to 4.70	0.94	-	0.94
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.11	1.58 to 36.88	-	1.58 to 36.88	7.38	-	7.38
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.11	0.73 to 16.96	-	0.73 to 16.96	3.39	-	3.39
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.11	0.71 to 16.66	-	0.71 to 16.66	3.33	-	3.33
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.11	0.01 to 0.27	-	0.01 to 0.27	0.05	-	0.05
Burbo Bank	No connectivity	33	No connectivity	0.11	0.01 to 0.26	-	0.01 to 0.26	0.05	-	0.05
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.11	0.04 to 0.91	-	0.04 to 0.91	0.18	-	0.18
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.11	0.01 to 0.28	-	0.01 to 0.28	0.06	-	0.06/
Ormonde Wind Farm	No connectivity	22	No connectivity	0.11	0.01 to 0.17	-	0.01 to 0.17	0.03	-	0.03
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.11	0.02 to 0.39	-	0.02 to 0.39	0.08	-	0.08
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.11	0.01 to 0.30	-	0.01 to 0.30	0.06	-	0.06
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.11	0.04 to 1.01	-	0.04 to 1.01	0.20	-	0.20
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.11	0.03 to 0.74	-	0.03 to 0.74	0.15	-	0.15
Total predicted impact (adult birds)					**13.44 to 313.50**	**0.10 to 2.27**	**13.34 to 311.23**	**62.70**	**0.45**	**62.25**
Increase in baseline mortality (%)					**0.29% to 6.76%**	**0.00% to 0.05%**	**0.29% to 6.71%**	**1.35%**	**0.01%**	**1.34%**

1.4.3.33 As the predicted impact on common guillemot from Handa SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.34 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Handa SPA, one (Table 1.55) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.56) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the

Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.56 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.55: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Handa SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	1	1	2	2	5	9	14	18	23	34	45
5%	2	5	7	9	11	23	45	68	90	113	169	225
10%	5	9	14	18	23	45	90	135	180	225	338	450
20%	9	18	27	36	45	90	180	270	360	450	675	901
30%	14	27	41	54	68	135	270	405	540	675	1,013	1,351
40%	18	36	54	72	90	180	360	540	720	901	1,351	1,801
50%	23	45	68	90	113	225	450	675	901	1,126	1,688	2,251
60%	27	54	81	108	135	270	540	810	1,081	1,351	2,026	2,702
70%	32	63	95	126	158	315	630	946	1,261	1,576	2,364	3,152
80%	36	72	108	144	180	360	720	1,081	1,441	1,801	2,702	3,602
90%	41	81	122	162	203	405	810	1,216	1,621	2,026	3,039	4,052
100%	45	90	135	180	225	450	901	1,351	1,801	2,251	3,377	4,503

Table 1.56: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Handa SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.39%	0.49%	0.73%	0.97%
5%	0.05%	0.10%	0.15%	0.19%	0.24%	0.49%	0.97%	1.46%	1.94%	2.43%	3.64%	4.86%
10%	0.10%	0.19%	0.29%	0.39%	0.49%	0.97%	1.94%	2.91%	3.89%	4.86%	7.29%	9.71%
20%	0.19%	0.39%	0.58%	0.78%	0.97%	1.94%	3.89%	5.83%	7.77%	9.71%	14.57%	19.43%
30%	0.29%	0.58%	0.87%	1.17%	1.46%	2.91%	5.83%	8.74%	11.66%	14.57%	21.86%	29.14%
40%	0.39%	0.78%	1.17%	1.55%	1.94%	3.89%	7.77%	11.66%	15.54%	19.43%	29.14%	38.86%
50%	0.49%	0.97%	1.46%	1.94%	2.43%	4.86%	9.71%	14.57%	19.43%	24.29%	36.43%	48.57%
60%	0.58%	1.17%	1.75%	2.33%	2.91%	5.83%	11.66%	17.49%	23.31%	29.14%	43.71%	58.28%
70%	0.68%	1.36%	2.04%	2.72%	3.40%	6.80%	13.60%	20.40%	27.20%	34.00%	51.00%	68.00%
80%	0.78%	1.55%	2.33%	3.11%	3.89%	7.77%	15.54%	23.31%	31.09%	38.86%	58.28%	77.71%
90%	0.87%	1.75%	2.62%	3.50%	4.37%	8.74%	17.49%	26.23%	34.97%	43.71%	65.57%	87.43%
100%	0.97%	1.94%	2.91%	3.89%	4.86%	9.71%	19.43%	29.14%	38.86%	48.57%	72.86%	97.14%

Shiant Isles SPA

1.4.3.35 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from the Shiant Isles SPA, an in-combination assessment is presented within Table 1.57 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.57: In-combination assessment for common guillemot from the Shiant Isles SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0149	0.07 to 1.75	-	0.07 to 1.75	0.35	-	0.35
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0149	0.04 to 0.94	-	0.04 to 0.94	0.19	-	0.19
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0149	0.73 to 17.02	-	0.73 to 17.02	3.40	-	3.40
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0149	0.33 to 7.81	-	0.33 to 7.81	1.56	-	1.56
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0149	0.01 to 0.13	-	0.01 to 0.13	0.03	-	0.03
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0149	0.05 to 1.16	-	0.05 to 1.16	0.23	-	0.23
West of Orkney Windfarm	2,794	2,462	0.0002[b]	0.0149	0.11 to 2.61	0.00 to 0.04	0.11 to 2.57	0.52	0.01	0.51
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0149	0.03 to 0.64	-	0.03 to 0.64	0.13	-	0.13
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0149	0.21 to 5.00	-	0.21 to 5.00	1.00	-	1.00
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0149	0.10 to 2.30	-	0.10 to 2.30	0.46	-	0.46
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0149	0.10 to 2.26	-	0.10 to 2.26	0.45	-	0.45
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0149	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Burbo Bank	No connectivity	33	No connectivity	0.0149	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0149	0.01 to 0.12	-	0.01 to 0.12	0.02	-	0.02
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0149	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0149	0.00 to 0.02	-	0.00 to 0.02	0.00	-	0.00
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0149	0.00 to 0.05	-	0.00 to 0.05	0.01	-	0.01
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0149	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0149	0.01 to 0.14	-	0.01 to 0.14	0.03	-	0.03
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0149	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Total predicted impact (adult birds)					**1.81 to 42.20**	**0.00 to 0.04**	**1.81 to 42.16**	**8.44**	**0.01**	**8.43**
Increase in baseline mortality (%)					**0.29% to 6.72%**	**0.00% to 0.01%**	**0.29% to 6.71%**	**1.34%**	**0.00%**	**1.34%**

1.4.3.36 As the predicted impact on common guillemot from Shiant Isles SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.37 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Shiant Isles SPA, one (Table 1.58) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.59) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.59 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.58: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Shiant Isles SPA

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	1	1	2	2	3	5	6
5%	0	1	1	1	2	3	6	9	12	15	23	30
10%	1	1	2	2	3	6	12	18	24	30	45	60
20%	1	2	4	5	6	12	24	36	48	60	90	121
30%	2	4	5	7	9	18	36	54	72	90	136	181
40%	2	5	7	10	12	24	48	72	97	121	181	241
50%	3	6	9	12	15	30	60	90	121	151	226	302
60%	4	7	11	14	18	36	72	109	145	181	271	362
70%	4	8	13	17	21	42	84	127	169	211	317	422
80%	5	10	14	19	24	48	97	145	193	241	362	483
90%	5	11	16	22	27	54	109	163	217	271	407	543
100%	6	12	18	24	30	60	121	181	241	302	452	603

Table 1.59: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Shiant Isles SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.38%	0.48%	0.72%	0.96%
5%	0.05%	0.10%	0.14%	0.19%	0.24%	0.48%	0.96%	1.44%	1.92%	2.40%	3.60%	4.80%
10%	0.10%	0.19%	0.29%	0.38%	0.48%	0.96%	1.92%	2.88%	3.84%	4.80%	7.20%	9.61%
20%	0.19%	0.38%	0.58%	0.77%	0.96%	1.92%	3.84%	5.76%	7.68%	9.61%	14.41%	19.21%
30%	0.29%	0.58%	0.86%	1.15%	1.44%	2.88%	5.76%	8.64%	11.53%	14.41%	21.61%	28.82%
40%	0.38%	0.77%	1.15%	1.54%	1.92%	3.84%	7.68%	11.53%	15.37%	19.21%	28.82%	38.42%
50%	0.48%	0.96%	1.44%	1.92%	2.40%	4.80%	9.61%	14.41%	19.21%	24.01%	36.02%	48.03%
60%	0.58%	1.15%	1.73%	2.31%	2.88%	5.76%	11.53%	17.29%	23.05%	28.82%	43.22%	57.63%
70%	0.67%	1.34%	2.02%	2.69%	3.36%	6.72%	13.45%	20.17%	26.90%	33.62%	50.43%	67.24%

	80%	0.77%	1.54%	2.31%	3.07%	3.84%	7.68%	15.37%	23.05%	30.74%	38.42%	57.63%	76.84%
	90%	0.86%	1.73%	2.59%	3.46%	4.32%	8.64%	17.29%	25.93%	34.58%	43.22%	64.84%	86.45%
	100%	0.96%	1.92%	2.88%	3.84%	4.80%	9.61%	19.21%	28.82%	38.42%	48.03%	72.04%	96.05%

Flannan Isles SPA

1.4.3.38 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from the Flannan Isles SPA, an in-combination assessment is presented within Table 1.60 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.60: In-combination assessment of for common guillemot from the Flannan Isles SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0284	0.14 to 3.34	-	0.14 to 3.34	0.67	-	0.67
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0284	0.08 to 1.79	-	0.08 to 1.79	0.36	-	0.36
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0284	1.39 to 32.45	-	1.39 to 32.45	6.49	-	6.49
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0284	0.64 to 14.90	-	0.64 to 14.90	2.98	-	2.98
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	125	No connectivity	0.0284	0.01 to 0.25	-	0.01 to 0.25	0.05	-	0.05
West of Duddon Sands Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0284	0.09 to 2.21	-	0.09 to 2.21	0.44	-	0.44
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0284	0.21 to 4.89	-	0.21 to 4.89	0.98	-	0.98
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0284	0.05 to 1.21	-	0.05 to 1.21	0.24	-	0.24
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0284	0.41 to 9.52	-	0.41 to 9.52	1.90	-	1.90
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0284	0.19 to 4.38	-	0.19 to 4.38	0.88	-	0.88
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0284	0.18 to 4.30	-	0.18 to 4.30	0.86	-	0.86
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0284	0.00 to 0.07	-	0.00 to 0.07	0.01	-	0.01
Burbo Bank	No connectivity	33	No connectivity	0.0284	0.00 to 0.07	-	0.00 to 0.07	0.01	-	0.01
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0284	0.01 to 0.23	-	0.01 to 0.23	0.05	-	0.05
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0284	0.00 to 0.07	-	0.00 to 0.07	0.01	-	0.01
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0284	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0284	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0284	0.00 to 0.08	-	0.00 to 0.08	0.02	-	0.02
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0284	0.01 to 0.26	-	0.01 to 0.26	0.05	-	0.05
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0284	0.01 to 0.19	-	0.01 to 0.19	0.04	-	0.04
Total predicted impact (adult birds)					**3.44 to 80.35**	**-**	**3.44 to 80.35**	**16.07**	**-**	**16.07**
Increase in baseline mortality (%)					**0.29% to 6.72%**	**-**	**0.29% to 6.72%**	**1.34%**	**-**	**1.34%**

1.4.3.39 As the predicted impact on common guillemot from Flannan Isles SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.40 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Flannan Isles SPA, one (Table 1.61) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.62) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered

regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.62 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.61: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Flannan Isles SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	1	1	2	3	5	6	9	11
5%	1	1	2	2	3	6	11	17	23	29	43	57
10%	1	2	3	5	6	11	23	34	46	57	86	115
20%	2	5	7	9	11	23	46	69	92	115	172	230
30%	3	7	10	14	17	34	69	103	138	172	258	344
40%	5	9	14	18	23	46	92	138	184	230	344	459
50%	6	11	17	23	29	57	115	172	230	287	430	574
60%	7	14	21	28	34	69	138	207	275	344	517	689
70%	8	16	24	32	40	80	161	241	321	402	603	804
80%	9	18	28	37	46	92	184	275	367	459	689	918
90%	10	21	31	41	52	103	207	310	413	517	775	1,033
100%	11	23	34	46	57	115	230	344	459	574	861	1,148

Table 1.62: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Flannan Isles SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.38%	0.48%	0.72%	0.96%
5%	0.05%	0.10%	0.14%	0.19%	0.24%	0.48%	0.96%	1.44%	1.92%	2.40%	3.60%	4.80%
10%	0.10%	0.19%	0.29%	0.38%	0.48%	0.96%	1.92%	2.88%	3.84%	4.80%	7.20%	9.60%
20%	0.19%	0.38%	0.58%	0.77%	0.96%	1.92%	3.84%	5.76%	7.68%	9.60%	14.40%	19.20%
30%	0.29%	0.58%	0.86%	1.15%	1.44%	2.88%	5.76%	8.64%	11.52%	14.40%	21.60%	28.79%
40%	0.38%	0.77%	1.15%	1.54%	1.92%	3.84%	7.68%	11.52%	15.36%	19.20%	28.79%	38.39%
50%	0.48%	0.96%	1.44%	1.92%	2.40%	4.80%	9.60%	14.40%	19.20%	23.99%	35.99%	47.99%
60%	0.58%	1.15%	1.73%	2.30%	2.88%	5.76%	11.52%	17.28%	23.03%	28.79%	43.19%	57.59%
70%	0.67%	1.34%	2.02%	2.69%	3.36%	6.72%	13.44%	20.16%	26.87%	33.59%	50.39%	67.19%
80%	0.77%	1.54%	2.30%	3.07%	3.84%	7.68%	15.36%	23.03%	30.71%	38.39%	57.59%	76.78%
90%	0.86%	1.73%	2.59%	3.46%	4.32%	8.64%	17.28%	25.91%	34.55%	43.19%	64.79%	86.38%
100%	0.96%	1.92%	2.88%	3.84%	4.80%	9.60%	19.20%	28.79%	38.39%	47.99%	71.98%	95.98%

St Kilda SPA

1.4.3.41 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from St Kilda SPA, an in-combination assessment is presented within Table 1.63 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.63: In-combination assessment for common guillemot from the St Kilda SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0455	0.23 to 5.35	-	0.23 to 5.35	1.07	-	1.07
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0455	0.12 to 2.86	-	0.12 to 2.86	0.57	-	0.57
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0455	2.22 to 51.99	-	2.22 to 51.99	10.40	-	10.37
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0455	1.02 to 23.86	-	1.02 to 23.86	4.77	-	4.77
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0455	0.02 to 0.40	-	0.02 to 0.40	0.08	-	0.08
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0455	0.15 to 3.54	-	0.15 to 3.54	0.71	-	0.71
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0455	0.34 to 7.84	-	0.34 to 7.84	1.57	-	1.57
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0455	0.08 to 1.94	-	0.08 to 1.94	0.39	-	0.39
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0455	0.65 to 15.25	-	0.65 to 15.25	3.05	-	3.05
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0455	0.30 to 7.01	-	0.30 to 7.01	1.40	-	1.40
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0455	0.29 to 6.89	-	0.29 to 6.89	1.38	-	1.38
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0455	0.00 to 0.11	-	0.00 to 0.11	0.02	-	0.02
Burbo Bank	No connectivity	33	No connectivity	0.0455	0.00 to 0.11	-	0.00 to 0.11	0.02	-	0.02
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0455	0.02 to 0.38	-	0.02 to 0.38	0.08	-	0.08
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0455	0.00 to 0.12	-	0.00 to 0.12	0.02	-	0.02
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0455	0.00 to 0.07	-	0.00 to 0.07	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0455	0.01 to 0.16	-	0.01 to 0.16	0.03	-	0.03
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0455	0.01 to 0.12	-	0.01 to 0.12	0.02	-	0.02
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0455	0.02 to 0.42	-	0.02 to 0.42	0.08	-	0.08
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0455	0.01 to 0.30	-	0.01 to 0.30	0.06	-	0.06
Total predicted impact (adult birds)					**5.52 to 128.74**	-	**5.52 to 128.74**	**25.75**	-	**25.75**
Increase in baseline mortality (%)					**0.29% to 6.72%**	-	**0.29% to 6.72%**	**1.34%**	-	**1.34%**

1.4.3.42 As the predicted impact on common guillemot from St Kilda SPA is >1% increase in baseline mortality, the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.43 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Flannan Isles SPA, one (Table 1.64) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.65) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.65 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.64: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the St Kilda SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	1	1	1	2	4	6	7	9	14	18
5%	1	2	3	4	5	9	18	28	37	46	69	92
10%	2	4	6	7	9	18	37	55	74	92	138	184
20%	4	7	11	15	18	37	74	110	147	184	276	368
30%	6	11	17	22	28	55	110	166	221	276	414	552
40%	7	15	22	29	37	74	147	221	294	368	552	736
50%	9	18	28	37	46	92	184	276	368	460	690	920
60%	11	22	33	44	55	110	221	331	441	552	828	1,103
70%	13	26	39	51	64	129	257	386	515	644	966	1,287
80%	15	29	44	59	74	147	294	441	589	736	1,103	1,471
90%	17	33	50	66	83	166	331	497	662	828	1,241	1,655
100%	18	37	55	74	92	184	368	552	736	920	1,379	1,839

Table 1.65: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the St Kilda SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.38%	0.48%	0.72%	0.96%
5%	0.05%	0.10%	0.14%	0.19%	0.24%	0.48%	0.96%	1.44%	1.92%	2.40%	3.60%	4.80%
10%	0.10%	0.19%	0.29%	0.38%	0.48%	0.96%	1.92%	2.88%	3.84%	4.80%	7.20%	9.60%
20%	0.19%	0.38%	0.58%	0.77%	0.96%	1.92%	3.84%	5.76%	7.68%	9.60%	14.41%	19.21%
30%	0.29%	0.58%	0.86%	1.15%	1.44%	2.88%	5.76%	8.64%	11.52%	14.41%	21.61%	28.81%
40%	0.38%	0.77%	1.15%	1.54%	1.92%	3.84%	7.68%	11.52%	15.37%	19.21%	28.81%	38.41%
50%	0.48%	0.96%	1.44%	1.92%	2.40%	4.80%	9.60%	14.41%	19.21%	24.01%	36.01%	48.02%
60%	0.58%	1.15%	1.73%	2.30%	2.88%	5.76%	11.52%	17.29%	23.05%	28.81%	43.22%	57.62%
70%	0.67%	1.34%	2.02%	2.69%	3.36%	6.72%	13.44%	20.17%	26.89%	33.61%	50.42%	67.22%
80%	0.77%	1.54%	2.30%	3.07%	3.84%	7.68%	15.37%	23.05%	30.73%	38.41%	57.62%	76.83%
90%	0.86%	1.73%	2.59%	3.46%	4.32%	8.64%	17.29%	25.93%	34.57%	43.22%	64.82%	86.43%
100%	0.96%	1.92%	2.88%	3.84%	4.80%	9.60%	19.21%	28.81%	38.41%	48.02%	72.03%	96.04%

Canna and Sanday SPA

1.4.3.44 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Canna and Sanday, an in-combination assessment is presented within Table 1.66 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.66: In-combination assessment for Common guillemot from the Canna and Sanday SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0113	0.06 to 1.33	-	0.06 to 1.33	0.27	-	0.27
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0113	0.03 to 0.71	-	0.03 to 0.71	0.14	-	0.14
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0113	0.55 to 12.91	-	0.55 to 12.91	2.58	-	2.58
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0113	0.25 to 5.93	-	0.25 to 5.93	1.19	-	1.19
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0113	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0113	0.04 to 0.88	-	0.04 to 0.88	0.18	-	0.18
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0113	0.08 to 1.95	-	0.08 to 1.95	0.39	-	0.39
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0113	0.02 to 0.48	-	0.02 to 0.48	0.10	-	0.10
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0113	0.16 to 3.79	-	0.16 to 3.79	0.76	-	0.76
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0113	0.07 to 1.74	-	0.07 to 1.74	0.35	-	0.35
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0113	0.07 to 1.71	-	0.07 to 1.71	0.34	-	0.34
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0113	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Burbo Bank	No connectivity	33	No connectivity	0.0113	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0113	0.00 to 0.09	-	0.00 to 0.09	0.02	-	0.02
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0113	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0113	0.00 to 0.02	-	0.00 to 0.02	0.00	-	0.00
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0113	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0113	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0113	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0113	0.00 to 0.08	-	0.00 to 0.08	0.02	-	0.02
Total predicted impact (adult birds)					**1.37 to 31.97**	-	**1.37 to 31.97**	**6.39**	-	**6.39**
Increase in baseline mortality (%)					**0.29% to 6.70%**	-	**0.29% to 6.70%**	**1.34%**	-	**1.34%**

1.4.3.45 As the predicted impact on common guillemot from Canna and Sanday SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.46 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Canna and Sanday SPA, one (Table 1.67) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.68) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.68 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.67: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Canna and Sanday SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	0	1	1	2	2	3	5
5%	0	0	1	1	1	2	5	7	9	11	17	23
10%	0	1	1	2	2	5	9	14	18	23	34	46
20%	1	2	3	4	5	9	18	27	37	46	69	91
30%	1	3	4	5	7	14	27	41	55	69	103	137
40%	2	4	5	7	9	18	37	55	73	91	137	183
50%	2	5	7	9	11	23	46	69	91	114	171	228
60%	3	5	8	11	14	27	55	82	110	137	206	274
70%	3	6	10	13	16	32	64	96	128	160	240	320
80%	4	7	11	15	18	37	73	110	146	183	274	365
90%	4	8	12	16	21	41	82	123	164	206	308	411
100%	5	9	14	18	23	46	91	137	183	228	343	457

Table 1.68: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Canna and Sanday SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.38%	0.48%	0.72%	0.96%
5%	0.05%	0.10%	0.14%	0.19%	0.24%	0.48%	0.96%	1.44%	1.92%	2.39%	3.59%	4.79%
10%	0.10%	0.19%	0.29%	0.38%	0.48%	0.96%	1.92%	2.87%	3.83%	4.79%	7.18%	9.58%
20%	0.19%	0.38%	0.57%	0.77%	0.96%	1.92%	3.83%	5.75%	7.66%	9.58%	14.36%	19.15%
30%	0.29%	0.57%	0.86%	1.15%	1.44%	2.87%	5.75%	8.62%	11.49%	14.36%	21.54%	28.73%
40%	0.38%	0.77%	1.15%	1.53%	1.92%	3.83%	7.66%	11.49%	15.32%	19.15%	28.73%	38.30%
50%	0.48%	0.96%	1.44%	1.92%	2.39%	4.79%	9.58%	14.36%	19.15%	23.94%	35.91%	47.88%
60%	0.57%	1.15%	1.72%	2.30%	2.87%	5.75%	11.49%	17.24%	22.98%	28.73%	43.09%	57.45%
70%	0.67%	1.34%	2.01%	2.68%	3.35%	6.70%	13.41%	20.11%	26.81%	33.51%	50.27%	67.03%
80%	0.77%	1.53%	2.30%	3.06%	3.83%	7.66%	15.32%	22.98%	30.64%	38.30%	57.45%	76.60%
90%	0.86%	1.72%	2.59%	3.45%	4.31%	8.62%	17.24%	25.85%	34.47%	43.09%	64.63%	86.18%
100%	0.96%	1.92%	2.87%	3.83%	4.79%	9.58%	19.15%	28.73%	38.30%	47.88%	71.81%	95.75%

Mingulay and Berneray SPA

1.4.3.47 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Mingulay and Berneray SPA an in-combination assessment is presented within Table 1.69 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.69: In-combination assessment for common guillemot from the Mingulay and Berneray SPA.

a – The plans/projects included within this in-combination assessment cover a large spatial area and therefore it is considered necessary and proportionate to apply a correction factor to account for the number of adult birds within the whole area and not presume that 100% of birds are adults (as done in the Mona Offshore Wind Project alone assessment). All projects have used the age-class proportions from Furness (2015). During the non-breeding season this derived from the adult/immature proportion from the Appendix tables, or during the breeding season from the stable-age structures. For common guillemot, the proportions are 57.47% of birds are adults in the breeding period, 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0392	0.20 to 4.61	-	0.20 to 4.61	0.92	-	0.92
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0392	0.11 to 2.47	-	0.11 to 2.47	0.49	-	0.49
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0392	1.92 to 44.79	-	1.92 to 44.79	8.96	-	8.96
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0392	0.88 to 20.56	-	0.88 to 20.56	4.11	-	4.11
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0392	0.01 to 0.34	-	0.01 to 0.34	0.07	-	0.07
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0392	0.13 to 3.05	-	0.13 to 3.05	0.61	-	0.61
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0392	0.29 to 6.76	-	0.29 to 6.76	1.35	-	1.35
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0392	0.07 to 1.67	-	0.07 to 1.67	0.33	-	0.33
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0392	0.56 to 13.14	-	0.56 to 13.14	2.63	-	2.63
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0392	0.26 to 6.04	-	0.26 to 6.04	1.21	-	1.21
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0392	0.25 to 5.94	-	0.25 to 5.94	1.19	-	1.19
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0392	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Burbo Bank	No connectivity	33	No connectivity	0.0392	0.00 to 0.09	-	0.00 to 0.09	0.02	-	0.02
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0392	0.01 to 0.32	-	0.01 to 0.32	0.06	-	0.06
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0392	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0392	0.00 to 0.06	-	0.00 to 0.06	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0392	0.01 to 0.14	-	0.01 to 0.14	0.03	-	0.03
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0392	0.00 to 0.11	-	0.00 to 0.11	0.02	-	0.02
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0392	0.02 to 0.36	-	0.02 to 0.36	0.07	-	0.07
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0392	0.01 to 0.26	-	0.01 to 0.26	0.05	-	0.05
Total predicted impact (adult birds)					**4.75 to 110.91**	-	**4.75 to 110.91**	**22.18**	-	**22.18**
Increase in baseline mortality (%)					**0.29% to 6.72%**	-	**0.29% to 6.72%**	**1.34%**	-	**1.34%**

1.4.3.48 As the predicted impact on common guillemot from Mingulay and Berneray SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.49 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Mingulay and Berneray SPA, one (Table 1.70) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.71) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.71 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.70: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Mingulay and Berneray SPA.

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)												
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	1	1	2	3	5	6	8	12	16
5%	1	2	2	3	4	8	16	24	32	40	59	79
10%	2	3	5	6	8	16	32	48	63	79	119	158
20%	3	6	10	13	16	32	63	95	127	158	238	317
30%	5	10	14	19	24	48	95	143	190	238	356	475
40%	6	13	19	25	32	63	127	190	254	317	475	634
50%	8	16	24	32	40	79	158	238	317	396	594	792
60%	10	19	29	38	48	95	190	285	380	475	713	951
70%	11	22	33	44	55	111	222	333	444	555	832	1,109
80%	13	25	38	51	63	127	254	380	507	634	951	1,268
90%	14	29	43	57	71	143	285	428	570	713	1,069	1,426
100%	16	32	48	63	79	158	317	475	634	792	1,188	1,584

Table 1.71: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Mingulay and Berneray SPA (red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.19%	0.29%	0.38%	0.48%	0.72%	0.96%
5%	0.05%	0.10%	0.14%	0.19%	0.24%	0.48%	0.96%	1.44%	1.92%	2.40%	3.60%	4.80%
10%	0.10%	0.19%	0.29%	0.38%	0.48%	0.96%	1.92%	2.88%	3.84%	4.80%	7.20%	9.60%
20%	0.19%	0.38%	0.58%	0.77%	0.96%	1.92%	3.84%	5.76%	7.68%	9.60%	14.40%	19.21%
30%	0.29%	0.58%	0.86%	1.15%	1.44%	2.88%	5.76%	8.64%	11.52%	14.40%	21.61%	28.81%
40%	0.38%	0.77%	1.15%	1.54%	1.92%	3.84%	7.68%	11.52%	15.36%	19.21%	28.81%	38.41%
50%	0.48%	0.96%	1.44%	1.92%	2.40%	4.80%	9.60%	14.40%	19.21%	24.01%	36.01%	48.01%
60%	0.58%	1.15%	1.73%	2.30%	2.88%	5.76%	11.52%	17.28%	23.05%	28.81%	43.21%	57.62%
70%	0.67%	1.34%	2.02%	2.69%	3.36%	6.72%	13.44%	20.17%	26.89%	33.61%	50.41%	67.22%
80%	0.77%	1.54%	2.30%	3.07%	3.84%	7.68%	15.36%	23.05%	30.73%	38.41%	57.62%	76.82%
90%	0.86%	1.73%	2.59%	3.46%	4.32%	8.64%	17.28%	25.93%	34.57%	43.21%	64.82%	86.42%
100%	0.96%	1.92%	2.88%	3.84%	4.80%	9.60%	19.21%	28.81%	38.41%	48.01%	72.02%	96.03%

North Colonsay and western cliffs SPA

1.4.3.50 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from North Colonsay and western cliffs SPA, an in-combination assessment is presented within Table 1.72 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.72: In-combination assessment for common guillemot from the North Colonsay and Western Cliffs SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0411	0.21 to 4.84	-	0.21 to 4.84	0.97	-	0.97
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0411	0.11 to 2.59	-	0.11 to 2.59	0.52	-	0.52
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.0411	2.01 to 46.96	-	2.01 to 46.96	9.39	-	9.39
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.0411	0.92 to 21.56	-	0.92 to 21.56	4.31	-	4.31
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0411	0.02 to 0.36	-	0.02 to 0.36	0.07	-	0.07
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0411	0.14 to 3.19	-	0.14 to 3.19	0.64	-	0.64
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0411	0.30 to 7.08	-	0.30 to 7.08	1.42	-	1.42
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.0411	0.08 to 1.75	-	0.08 to 1.75	0.35	-	0.35
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.0411	0.59 to 13.78	-	0.59 to 13.78	2.76	-	2.76
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.0411	0.27 to 6.34	-	0.27 to 6.34	1.27	-	1.27
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0411	0.27 to 6.22	-	0.27 to 6.22	1.24	-	1.24
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0411	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Burbo Bank	No connectivity	33	No connectivity	0.0411	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0411	0.01 to 0.34	-	0.01 to 0.34	0.07	-	0.07
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0411	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0411	0.00 to 0.06	-	0.00 to 0.06	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0411	0.01 to 0.15	-	0.01 to 0.15	0.03	-	0.03
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0411	0.00 to 0.11	-	0.00 to 0.11	0.02	-	0.02
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0411	0.02 to 0.38	-	0.02 to 0.38	0.08	-	0.08
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0411	0.01 to 0.28	-	0.01 to 0.28	0.05	-	0.05
Total predicted impact (adult birds)					**4.06 to 94.73**	-	**4.98 to 116.29**	**23.26**	-	**23.26**
Increase in baseline mortality (%)					**0.25% to 5.75%**	-	**0.25% to 5.75%**	**1.41%**	-	**1.41%**

1.4.3.51 As the predicted impact on common guillemot from North Colonsay and Western Cliffs SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.52 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from North Colonsay and Western Cliffs SPA, one (Table 1.73) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.74) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.74 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.73: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the North Colonsay and Western Cliffs SPA.

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)												
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	1	1	2	3	5	7	8	12	17
5%	1	2	2	3	4	8	17	25	33	42	62	83
10%	2	3	5	7	8	17	33	50	66	83	125	166
20%	3	7	10	13	17	33	66	100	133	166	249	332
30%	5	10	15	20	25	50	100	150	199	249	374	498
40%	7	13	20	27	33	66	133	199	266	332	498	664
50%	8	17	25	33	42	83	166	249	332	415	623	831
60%	10	20	30	40	50	100	199	299	399	498	748	997
70%	12	23	35	47	58	116	233	349	465	581	872	1,163
80%	13	27	40	53	66	133	266	399	532	664	997	1,329
90%	15	30	45	60	75	150	299	449	598	748	1,121	1,495
100%	17	33	50	66	83	166	332	498	664	831	1,246	1,661

Table 1.74: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the North Colonsay and Western Cliffs SPA (red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.20%	0.30%	0.40%	0.50%	0.76%	1.01%
5%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.01%	1.51%	2.01%	2.52%	3.78%	5.03%
10%	0.10%	0.20%	0.30%	0.40%	0.50%	1.01%	2.01%	3.02%	4.03%	5.03%	7.55%	10.07%
20%	0.20%	0.40%	0.60%	0.81%	1.01%	2.01%	4.03%	6.04%	8.05%	10.07%	15.10%	20.14%
30%	0.30%	0.60%	0.91%	1.21%	1.51%	3.02%	6.04%	9.06%	12.08%	15.10%	22.65%	30.20%
40%	0.40%	0.81%	1.21%	1.61%	2.01%	4.03%	8.05%	12.08%	16.11%	20.14%	30.20%	40.27%
50%	0.50%	1.01%	1.51%	2.01%	2.52%	5.03%	10.07%	15.10%	20.14%	25.17%	37.76%	50.34%
60%	0.60%	1.21%	1.81%	2.42%	3.02%	6.04%	12.08%	18.12%	24.16%	30.20%	45.31%	60.41%
70%	0.70%	1.41%	2.11%	2.82%	3.52%	7.05%	14.10%	21.14%	28.19%	35.24%	52.86%	70.48%
80%	0.81%	1.61%	2.42%	3.22%	4.03%	8.05%	16.11%	24.16%	32.22%	40.27%	60.41%	80.54%
90%	0.91%	1.81%	2.72%	3.62%	4.53%	9.06%	18.12%	27.18%	36.25%	45.31%	67.96%	90.61%
100%	1.01%	2.01%	3.02%	4.03%	5.03%	10.07%	20.14%	30.20%	40.27%	50.34%	75.51%	100.68%

Ailsa Craig SPA

1.4.3.53 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Ailsa Craig SPA, an in-combination assessment is presented within Table 1.75 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.75: In-combination assessment for Common guillemot from the Ailsa Craig SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.016	0.08 to 1.88	-	0.08 to 1.88	0.38	-	0.38
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.016	0.04 to 1.00	-	0.04 to 1.00	0.20	-	0.20
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.016	0.78 to 18.28	-	0.78 to 18.28	3.66	-	3.66
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.016	0.36 to 8.39	-	0.36 to 8.39	1.68	-	1.68
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.016	0.01 to 0.14	-	0.01 to 0.14	0.03	-	0.03
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.016	0.05 to 1.24	-	0.05 to 1.24	0.25	-	0.25
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.016	0.12 to 2.76	-	0.12 to 2.76	0.55	-	0.55
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.016	0.03 to 0.68	-	0.03 to 0.68	0.14	-	0.14
Morecambe Offshore Windfarm Generation Assets	No connectivity	8,315	No connectivity	0.016	0.23 to 5.36	-	0.23 to 5.36	1.07	-	1.07
Morgan Offshore Wind Project Generation Assets	No connectivity	3,824	No connectivity	0.016	0.11 to 2.47	-	0.11 to 2.47	0.49	-	0.49
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.016	0.10 to 2.42	-	0.10 to 2.42	0.48	-	0.48
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.016	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Burbo Bank	No connectivity	33	No connectivity	0.016	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.016	0.01 to 0.13	-	0.01 to 0.13	0.03	-	0.03
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.016	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Ormonde Wind Farm	No connectivity	22	No connectivity	0.016	0.00 to 0.03	-	0.00 to 0.03	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.016	0.00 to 0.06	-	0.00 to 0.06	0.01	-	0.01
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.016	0.00 to 0.04	-	0.00 to 0.04	0.01	-	0.01
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.016	0.01 to 0.15	-	0.01 to 0.15	0.03	-	0.03
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.016	0.00 to 0.11	-	0.00 to 0.11	0.02	-	0.02
Total predicted impact (adult birds)					**1.94 to 45.27**	-	**1.94 to 45.27**	**9.05**	-	**9.05**
Increase in baseline mortality (%)					**0.30% to 7.07%**	-	**0.30% to 7.07%**	**1.41%**	-	**1.41%**

1.4.3.54 As the predicted impact on common guillemot from Ailsa Craig SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.55 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Ailsa Craig SPA, one (Table 1.76) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.77) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for

multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).Cells within Table 1.77 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.76: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Ailsa Craig SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	1	1	2	3	3	5	6
5%	0	1	1	1	2	3	6	10	13	16	24	32
10%	1	1	2	3	3	6	13	19	26	32	49	65
20%	1	3	4	5	6	13	26	39	52	65	97	129
30%	2	4	6	8	10	19	39	58	78	97	146	194
40%	3	5	8	10	13	26	52	78	103	129	194	259
50%	3	6	10	13	16	32	65	97	129	162	243	323
60%	4	8	12	16	19	39	78	116	155	194	291	388
70%	5	9	14	18	23	45	91	136	181	226	340	453
80%	5	10	16	21	26	52	103	155	207	259	388	517
90%	6	12	17	23	29	58	116	175	233	291	437	582
100%	6	13	19	26	32	65	129	194	259	323	485	647

Table 1.77: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Ailsa Craig SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.01%	0.01%	0.02%	0.02%	0.04%	0.08%	0.12%	0.16%	0.20%	0.29%	0.39%
5%	0.02%	0.04%	0.06%	0.08%	0.10%	0.20%	0.39%	0.59%	0.78%	0.98%	1.47%	1.96%
10%	0.04%	0.08%	0.12%	0.16%	0.20%	0.39%	0.78%	1.18%	1.57%	1.96%	2.94%	3.92%
20%	0.08%	0.16%	0.24%	0.31%	0.39%	0.78%	1.57%	2.35%	3.14%	3.92%	5.88%	7.84%
30%	0.12%	0.24%	0.35%	0.47%	0.59%	1.18%	2.35%	3.53%	4.70%	5.88%	8.82%	11.76%
40%	0.16%	0.31%	0.47%	0.63%	0.78%	1.57%	3.14%	4.70%	6.27%	7.84%	11.76%	15.68%
50%	0.20%	0.39%	0.59%	0.78%	0.98%	1.96%	3.92%	5.88%	7.84%	9.80%	14.70%	19.60%
60%	0.24%	0.47%	0.71%	0.94%	1.18%	2.35%	4.70%	7.05%	9.41%	11.76%	17.64%	23.52%
70%	0.27%	0.55%	0.82%	1.10%	1.37%	2.74%	5.49%	8.23%	10.97%	13.72%	20.58%	27.44%
80%	0.31%	0.63%	0.94%	1.25%	1.57%	3.14%	6.27%	9.41%	12.54%	15.68%	23.52%	31.36%
90%	0.35%	0.71%	1.06%	1.41%	1.76%	3.53%	7.05%	10.58%	14.11%	17.64%	26.46%	35.27%
100%	0.39%	0.78%	1.18%	1.57%	1.96%	3.92%	7.84%	11.76%	15.68%	19.60%	29.40%	39.19%

Rathlin Island SPA

1.4.3.56 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Rathlin Island SPA, an in-combination assessment is presented within Table 1.78 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.78: In-combination assessment for common guillemot from the Rathlin Island SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.2664	1.34 to 31.35	-	1.34 to 31.35	6.27	-	6.27
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.2664	0.72 to 16.77	-	0.72 to 16.77	3.35	-	3.35
Erebus Floating Wind Demo	No connectivity	16,322	No connectivity	0.2664	13.02 to 304.37	-	13.02 to 304.37	60.87	-	60.87
Llŷr 1 Floating Offshore Wind Farm	No connectivity	13,009	No connectivity	0.2664	5.99 to 139.73	-	5.99 to 139.73	27.95	-	27.95
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.2664	0.10 to 2.33	-	0.10 to 2.33	0.47	-	0.47
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.2664	0.89 to 20.70	-	0.89 to 20.70	4.14	-	4.14
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.2664	1.96 to 45.92	-	1.96 to 45.92	9.18	-	9.18
White Cross Offshore Windfarm	No connectivity	610	No connectivity	0.2664	0.49 to 11.37	-	0.49 to 11.37	2.27	-	2.27
Morecambe Offshore Windfarm Generation Assets	No connectivity	4,404	No connectivity	0.2664	3.83 to 89.31	-	3.83 to 89.31	17.86	-	17.86
Morgan Offshore Wind Project Generation Assets	No connectivity	8,315	No connectivity	0.2664	1.76 to 41.07	-	1.76 to 41.07	8.21	-	8.21
Mona Offshore Wind Project	No connectivity	3,824	No connectivity	0.2664	1.73 to 40.34	-	1.73 to 40.34	8.07	-	8.07
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.2664	0.03 to 0.67	-	0.03 to 0.67	0.13	-	0.13
Burbo Bank	No connectivity	33	No connectivity	0.2664	0.03 to 0.62	-	0.03 to 0.62	0.12	-	0.12
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.2664	0.09 to 2.20	-	0.09 to 2.20	0.44	-	0.44
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.2664	0.03 to 0.68	-	0.03 to 0.68	0.14	-	0.14
Ormonde Wind Farm	No connectivity	22	No connectivity	0.2664	0.02 to 0.42	-	0.02 to 0.42	0.08	-	0.08
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.2664	0.04 to 0.94	-	0.04 to 0.94	0.19	-	0.19
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.2664	0.03 to 0.73	-	0.03 to 0.73	0.15	-	0.15
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.2664	0.10 to 2.44	-	0.10 to 2.44	0.49	-	0.49
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.2664	0.08 to 1.78	-	0.08 to 1.78	0.36	-	0.36
Total predicted impact (adult birds)					**32.30 to 753.74**	-	**32.30 to 753.74**	**150.75**	-	**150.75**
Increase in baseline mortality (%)					**0.30% to 7.07%**	-	**0.30% to 7.07%**	**1.41%**	-	**1.41%**

1.4.3.57 As the predicted impact on common guillemot from Rathlin Island SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to conclude an if an AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.58 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Rathlin Island SPA, one (Table 1.79) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.80) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered

regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.80 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.79: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Rathlin Island SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	1	2	3	4	5	11	22	32	43	54	81	108
5%	5	11	16	22	27	54	108	162	215	269	404	538
10%	11	22	32	43	54	108	215	323	431	538	808	1,077
20%	22	43	65	86	108	215	431	646	861	1,077	1,615	2,154
30%	32	65	97	129	162	323	646	969	1,292	1,615	2,423	3,230
40%	43	86	129	172	215	431	861	1,292	1,723	2,154	3,230	4,307
50%	54	108	162	215	269	538	1,077	1,615	2,154	2,692	4,038	5,384
60%	65	129	194	258	323	646	1,292	1,938	2,584	3,230	4,845	6,461
70%	75	151	226	301	377	754	1,507	2,261	3,015	3,769	5,653	7,537
80%	86	172	258	345	431	861	1,723	2,584	3,446	4,307	6,461	8,614
90%	97	194	291	388	485	969	1,938	2,907	3,876	4,845	7,268	9,691
100%	108	215	323	431	538	1,077	2,154	3,230	4,307	5,384	8,076	10,768

Table 1.80: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Rathlin Island SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.01%	0.02%	0.03%	0.04%	0.05%	0.10%	0.20%	0.30%	0.40%	0.50%	0.76%	1.01%
5%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.01%	1.51%	2.02%	2.52%	3.79%	5.05%
10%	0.10%	0.20%	0.30%	0.40%	0.50%	1.01%	2.02%	3.03%	4.04%	5.05%	7.57%	10.10%
20%	0.20%	0.40%	0.61%	0.81%	1.01%	2.02%	4.04%	6.06%	8.08%	10.10%	15.15%	20.20%
30%	0.30%	0.61%	0.91%	1.21%	1.51%	3.03%	6.06%	9.09%	12.12%	15.15%	22.72%	30.29%
40%	0.40%	0.81%	1.21%	1.62%	2.02%	4.04%	8.08%	12.12%	16.16%	20.20%	30.29%	40.39%
50%	0.50%	1.01%	1.51%	2.02%	2.52%	5.05%	10.10%	15.15%	20.20%	25.25%	37.87%	50.49%
60%	0.61%	1.21%	1.82%	2.42%	3.03%	6.06%	12.12%	18.18%	24.24%	30.29%	45.44%	60.59%
70%	0.71%	1.41%	2.12%	2.83%	3.53%	7.07%	14.14%	21.21%	28.27%	35.34%	53.02%	70.69%
80%	0.81%	1.62%	2.42%	3.23%	4.04%	8.08%	16.16%	24.24%	32.31%	40.39%	60.59%	80.79%
90%	0.91%	1.82%	2.73%	3.64%	4.54%	9.09%	18.18%	27.27%	36.35%	45.44%	68.16%	90.88%
100%	1.01%	2.02%	3.03%	4.04%	5.05%	10.10%	20.20%	30.29%	40.39%	50.49%	75.74%	100.98%

Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA

1.4.3.59 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA, an in-combination assessment is presented within Table 1.81 (30-70% displacement and 1-10% mortality; 70% displacement and 2% mortality).

Table 1.81: In-combination assessment for common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 57.60% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation

c – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.487.

Project	Un-apportioned abundances (adult birds) [a]		Apportioning values		Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			Apportioned displacement impact values (70% displacement, 2% mortality)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual	Breeding	Non-breeding
Awel y Môr Offshore Wind Farm	No connectivity	1,681	No connectivity	0.0447	0.22 to 5.26	-	0.22 to 5.26	1.05	-	1.05
Burbo Bank Extension Offshore Wind Farm	No connectivity	899	No connectivity	0.0447	0.12 to 2.81	-	0.12 to 2.81	0.56	-	0.56
Erebus Floating Wind Demo	7,001	16,322	0.754 [b]	0.0447	18.03 to 420.58	15.84 to 369.51	2.19 to 51.07	84.12	73.90	10.21
Llŷr 1 Floating Offshore Wind Farm	2,026	7,493	0.487 [b]	0.0447	16.84 to 92.51	2.96 to 69.07	1.00 to 23.44	18.50	13.81	4.69
TwinHub (Wave Hub Floating Wind Farm)	No connectivity	125	No connectivity	0.0447	0.02 to 0.39	-	0.02 to 0.39	0.08	-	0.08
Walney (3 and 4) Extension Offshore Wind Farm	No connectivity	1,110	No connectivity	0.0447	0.15 to 3.47	-	0.15 to 3.47	0.69	-	0.69
West of Orkney Windfarm	No connectivity	2,462	No connectivity	0.0447	0.33 to 7.70	-	0.33 to 7.70	1.54	-	1.54
White Cross Offshore Windfarm	3,304	610	0.487 [c]	0.0447	4.91 to 114.54	4.83 to 112.63	0.08 to 1.91	22.91	22.53	0.38
Morecambe Offshore Windfarm Generation Assets	No connectivity	4,404	No connectivity	0.0447	0.59 to 13.78	-	0.59 to 13.78	2.76	-	2.76
Morgan Offshore Wind Project Generation Assets	No connectivity	2,362	No connectivity	0.0447	0.32 to 7.39	-	0.32 to 7.39	1.48	-	1.48
Mona Offshore Wind Project	No connectivity	2,163	No connectivity	0.0447	0.29 to 6.77	-	0.29 to 6.77	1.35	-	1.35
Gap-filled projects										
Barrow Offshore Wind Farm	No connectivity	62	No connectivity	0.0447	0.00 to 0.11	-	0.00 to 0.11	0.02		0.02
Burbo Bank	No connectivity	33	No connectivity	0.0447	0.00 to 0.10	-	0.00 to 0.10	0.02	-	0.02
Gwynt Y Môr Offshore Wind Farm	No connectivity	118	No connectivity	0.0447	0.02 to 0.37	-	0.02 to 0.37	0.07	-	0.07
North Hoyle Offshore Wind Farm	No connectivity	63	No connectivity	0.0447	0.00 to 0.11	-	0.00 to 0.11	0.02		0.02
Ormonde Wind Farm	No connectivity	22	No connectivity	0.0447	0.00 to 0.07	-	0.00 to 0.07	0.01	-	0.01
Robin Rigg Offshore Wind Farm	No connectivity	51	No connectivity	0.0447	0.01 to 0.16	-	0.01 to 0.16	0.03	-	0.03
Rhyl Flats Offshore Wind Farm	No connectivity	39	No connectivity	0.0447	0.01 to 0.12	-	0.01 to 0.12	0.02	-	0.02
Walney 1 & 2 Offshore Wind Farms	No connectivity	131	No connectivity	0.0447	0.02 to 0.41	-	0.02 to 0.41	0.08	-	0.08
West of Duddon Sands Offshore Wind Farm	No connectivity	96	No connectivity	0.0447	0.01 to 0.30	-	0.01 to 0.30	0.06	-	0.06
Total predicted impact (adult birds)					**41.92 to 677.68**	**23.62 to 551.21**	**5.42 to 126.47**	**135.54**	**110.24**	**25.29**
Increase in baseline mortality (%)					**1.72% to 27.83%**	**0.97% to 22.63%**	**0.22% to 5.19%**	**5.57%**	**4.53%**	**1.04%**

1.4.3.60 As the predicted impact on common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality the impact is further investigated by a PVA (see section 1.6.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.61 Two matrix tables are presented to indicate the varying potential impacts on common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA, one (**Table** 1.82) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.83) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for common guillemot. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) , the single cell highlighted yellow represents the displacement scenario (70%

displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.83 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.3).

Table 1.82: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	1	2	3	4	5	11	22	32	43	54	81	108
5%	5	11	16	22	27	54	108	162	215	269	404	538
10%	11	22	32	43	54	108	215	323	431	538	808	1,077
20%	22	43	65	86	108	215	431	646	861	1,077	1,615	2,154
30%	32	65	97	129	162	323	646	969	1,292	1,615	2,423	3,230
40%	43	86	129	172	215	431	861	1,292	1,723	2,154	3,230	4,307
50%	54	108	162	215	269	538	1,077	1,615	2,154	2,692	4,038	5,384
60%	65	129	194	258	323	646	1,292	1,938	2,584	3,230	4,845	6,461
70%	75	151	226	301	377	754	1,507	2,261	3,015	3,769	5,653	7,537
80%	86	172	258	345	431	861	1,723	2,584	3,446	4,307	6,461	8,614
90%	97	194	291	388	485	969	1,938	2,907	3,876	4,845	7,268	9,691
100%	108	215	323	431	538	1,077	2,154	3,230	4,307	5,384	8,076	10,768

Table 1.83: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on common guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.04%	0.08%	0.12%	0.16%	0.20%	0.40%	0.80%	1.19%	1.59%	1.99%	2.98%	3.98%
5%	0.20%	0.40%	0.60%	0.80%	0.99%	1.99%	3.98%	5.96%	7.95%	9.94%	14.91%	19.88%
10%	0.40%	0.80%	1.19%	1.59%	1.99%	3.98%	7.95%	11.93%	15.90%	19.88%	29.82%	39.75%
20%	0.80%	1.59%	2.39%	3.18%	3.98%	7.95%	15.90%	23.85%	31.80%	39.75%	59.63%	79.51%
30%	1.19%	2.39%	3.58%	4.77%	5.96%	11.93%	23.85%	35.78%	47.70%	59.63%	89.45%	119.26%
40%	1.59%	3.18%	4.77%	6.36%	7.95%	15.90%	31.80%	47.70%	63.61%	79.51%	119.26%	159.01%
50%	1.99%	3.98%	5.96%	7.95%	9.94%	19.88%	39.75%	59.63%	79.51%	99.38%	149.08%	198.77%
60%	2.39%	4.77%	7.16%	9.54%	11.93%	23.85%	47.70%	71.56%	95.41%	119.26%	178.89%	238.52%
70%	2.78%	5.57%	8.35%	11.13%	13.91%	27.83%	55.66%	83.48%	111.31%	139.14%	208.71%	278.28%
80%	3.18%	6.36%	9.54%	12.72%	15.90%	31.80%	63.61%	95.41%	127.21%	159.01%	238.52%	318.03%
90%	3.58%	7.16%	10.73%	14.31%	17.89%	35.78%	71.56%	107.33%	143.11%	178.89%	268.34%	357.78%
100%	3.98%	7.95%	11.93%	15.90%	19.88%	39.75%	79.51%	119.26%	159.01%	198.77%	298.15%	397.54%

Manx shearwater

Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA

1.4.3.62 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in Manx shearwater baseline mortality from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA, an in-combination assessment is presented within Table 1.84 (30-70% displacement and 1-10% mortality).

Table 1.84: In-combination assessment for Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

a – the apportioning value during the breeding season was taken from project specific documentation

b – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.0421.

c – the apportioning value during the breeding season has used that of Erebus Floating Wind Demo, specifically 0.003.

d – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.085.

e – During the breeding season age-class proportion are not able to be calculated due to the inability to age Manx shearwater on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 62.77% of birds are adults in the pre-breeding and post-breeding periods.

Project	Un-apportioned abundances (adult birds) [e]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	111	26	134	0.00326	0.0421 [a]	0.00326	0.00 to 0.03	0.00 to 0.08	0.00 to 0.03	0.01 to 0.13
Burbo Bank Extension Offshore Wind Farm	0	444	1	0.00326	0.0421 [b]	0.00326	0.00 to 0.00	0.06 to 1.31	0.00 to 0.00	0.06 to 1.31
Erebus Floating Wind Demo	11	1540	350	0.00326	0.003 [a]	0.00326	0.00 to 0.00	0.01 to 0.32	0.00 to 0.08	0.02 to 0.41
TwinHub (Wave Hub Floating Wind Farm)	0	1270	2	0.00326	0.003 [c]	0.00326	0.00 to 0.00	0.01 to 0.27	0.00 to 0.00	0.01 to 0.27
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	795	3434	17	0.00326	0.003 [a]	0.00326	0.01 to 0.18	0.03 to 0.72	0.00 to 0.00	0.04 to 0.91
Mona Offshore Wind Project	2	1249	10	0.00326	0.1134 [a]	0.00326	0.00 to 0.00	0.42 to 9.91	0.00 to 0.00	0.43 to 9.92
Morecambe Offshore Windfarm Generation Assets	1015	4705	1663	0.00326	0.0863 [a]	0.00326	0.01 to 0.23	1.22 to 28.42	0.02 to 0.38	1.24 to 29.03
Morgan Offshore Wind Project Generation Assets	0	1254	241	0.00326	0.085 [a]	0.00326	0.00 to 0.00	0.32 to 7.46	0.00 to 0.06	0.32 to 7.52
Ormonde Wind Farm	0	1001	1	0.00326	0.085 [d]	0.00326	0.00 to 0.00	0.26 to 5.96	0.00 to 0.00	0.26 to 5.96
Rampion Offshore Wind Farm	0	33	0	0.00326	No connectivity	0.00326	0.00 to 0.00	NA to NA	0.00 to 0.00	0.00 to 0.00
Rampion 2 Offshore Wind Farm	0	0	0	0.00326	No connectivity	0.00326	0.00 to 0.00	NA to NA	0.00 to 0.00	0.00 to 0.00
Walney (3 and 4) Extension Offshore Wind Farm	0	588	203	0.00326	0.085 [d]	0.00326	0.00 to 0.00	0.15 to 3.50	0.00 to 0.05	0.15 to 3.55
West of Duddon Sands Offshore Wind Farm	1	544	2	0.00326	0.085 [d]	0.00326	0.00 to 0.00	0.14 to 3.24	0.00 to 0.00	0.14 to 3.24
West of Orkney Windfarm	0	8	2	0.00326	No connectivity	0.00326	0.00 to 0.00	NA to NA	0.00 to 0.00	0.00 to 0.00
White Cross Offshore Windfarm	7,611	33	14	0.00326	0.0028 [a]	0.00326	0.07 to 1.74	0.00 to 0.01	0.00 to 0.00	0.07 to 1.75
Gap-filled projects										
Barrow Offshore Wind Farm	0	2	0	0.00326	0.085 [d]	0.00326	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.01
Burbo Bank Offshore Wind Farm	0	2	1	0.00326	0.0421 [b]	0.00326	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00
Gwynt Y Môr Offshore Wind Farm	1	13	2	0.00326	0.0421 [b]	0.00326	0.00 to 0.00	0.00 to 0.04	0.00 to 0.00	0.00 to 0.02
North Hoyle Offshore Wind Farm	0	2	0	0.00326	0.0421 [b]	0.00326	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	1.00 to 1.02
Robin Rigg Offshore Wind Farm	0	3	1	0.00326	0.085 [d]	0.00326	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00 to 0.01
Rhyl Flats	0	4	1	0.00326	0.0421 [b]	0.00326	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.01
Walney 1 & 2 Offshore Wind Farms	1	14	3	0.00326	0.085 [d]	0.00326	0.00 to 0.00	0.00 to 0.08	0.00 to 0.00	0.00 to 0.05
Total predicted impact (adult birds)							**0.09 to 2.18**	**2.63 to 61.37**	**0.03 to 0.60**	**2.75 to 64.15**
Increase in baseline mortality (%)							**0.00% to 0.05%**	**0.06% to 1.46%**	**0.00% to 0.01%**	**0.07% to 1.52%**

1.4.3.63 As the predicted impact on Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA is <1% increase in baseline mortality, which is likely to be undetectable against natural variation, the impact is not considered to hinder the conservation objectives of the site, and therefore, it is concluded beyond reasonable scientific doubt that there would be no AEoSI from the Mona Offshore Wind Project in-combination with other plans and projects.

1.4.3.64 Two matrix tables are presented to indicate the varying potential impacts on Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA, one (Table 1.85) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.86) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for Manx shearwater. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.86 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.5).

Table 1.85: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	1	2	3	4	5	7	9
5%	0	1	1	2	2	5	9	14	18	23	34	46
10%	1	2	3	4	5	9	18	27	37	46	69	92
20%	2	4	5	7	9	18	37	55	73	92	137	183
30%	3	5	8	11	14	27	55	82	110	137	206	275
40%	4	7	11	15	18	37	73	110	147	183	275	367
50%	5	9	14	18	23	46	92	137	183	229	344	458
60%	5	11	16	22	27	55	110	165	220	275	412	550
70%	6	13	19	26	32	64	128	192	257	321	481	642
80%	7	15	22	29	37	73	147	220	293	367	550	733
90%	8	16	25	33	41	82	165	247	330	412	619	825
100%	9	18	27	37	46	92	183	275	367	458	687	916

Table 1.86: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.04%	0.07%	0.09%	0.11%	0.16%	0.22%
5%	0.01%	0.02%	0.03%	0.04%	0.05%	0.11%	0.22%	0.33%	0.44%	0.54%	0.82%	1.09%
10%	0.02%	0.04%	0.07%	0.09%	0.11%	0.22%	0.44%	0.65%	0.87%	1.09%	1.63%	2.18%
20%	0.04%	0.09%	0.13%	0.17%	0.22%	0.44%	0.87%	1.31%	1.74%	2.18%	3.27%	4.36%
30%	0.07%	0.13%	0.20%	0.26%	0.33%	0.65%	1.31%	1.96%	2.61%	3.27%	4.90%	6.53%
40%	0.09%	0.17%	0.26%	0.35%	0.44%	0.87%	1.74%	2.61%	3.48%	4.36%	6.53%	8.71%
50%	0.11%	0.22%	0.33%	0.44%	0.54%	1.09%	2.18%	3.27%	4.36%	5.45%	8.17%	10.89%
60%	0.13%	0.26%	0.39%	0.52%	0.65%	1.31%	2.61%	3.92%	5.23%	6.53%	9.80%	13.07%
70%	0.15%	0.30%	0.46%	0.61%	0.76%	1.52%	3.05%	4.57%	6.10%	7.62%	11.43%	15.25%
80%	0.17%	0.35%	0.52%	0.70%	0.87%	1.74%	3.48%	5.23%	6.97%	8.71%	13.07%	17.42%

	90%	0.20%	0.39%	0.59%	0.78%	0.98%	1.96%	3.92%	5.88%	7.84%	9.80%	14.70%	19.60%
	100%	0.22%	0.44%	0.65%	0.87%	1.09%	2.18%	4.36%	6.53%	8.71%	10.89%	16.34%	21.78%

Copeland Islands SPA

1.4.3.65 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in Manx shearwater baseline mortality from Copeland Islands SPA, an in-combination assessment is presented within Table 1.87 (30-70% displacement and 1-10% mortality).

Table 1.87: In-combination assessment for Manx shearwater from the Copeland Island SPA.

a – the apportioning value during the breeding season was taken from project specific documentation

b – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.0059.

c – the apportioning value during the breeding season has used that of Erebus Floating Wind Demo, specifically 0.0028.

d – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.035.

e – During the breeding season age-class proportion are not able to be calculated due to the inability to age Manx shearwater on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 62.77% of birds are adults in the pre-breeding and post-breeding periods.

Project	Un-apportioned abundances (adult birds) [e]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	111	26	134	0.001	0.0059 [a]	0.001	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03
Burbo Bank Extension Offshore Wind Farm	0	444	1	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.01 to 0.18	0.00 to 0.00	0.01 to 0.18
Erebus Floating Wind Demo	11	1540	350	0.001	0.0028 [a]	0.001	0.00 to 0.00	0.01 to 0.30	0.00 to 0.02	0.01 to 0.33
TwinHub (Wave Hub Floating Wind Farm)	0	1270	2	0.001	0.0028 [c]	0.001	0.00 to 0.00	0.01 to 0.25	0.00 to 0.00	0.01 to 0.25
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	795	3434	17	0.001	0.0000 [a]	0.001	0.00 to 0.06	0.00 to 0.00	0.00 to 0.00	0.00 to 0.06
Ormonde Wind Farm	0	1001	1	0.001	0.035 [d]	0.001	0.00 to 0.00	0.11 to 2.45	0.00 to 0.00	0.11 to 2.45
Mona Offshore Wind Project	2	1249	10	0.001	0.022 [a]	0.001	0.00 to 0.00	0.08 to 1.92	0.00 to 0.00	0.08 to 1.92
Morecambe Offshore Windfarm Generation Assets	1015	4705	1663	0.001	0.0222 [a]	0.001	0.00 to 0.07	0.31 to 7.31	0.00 to 0.12	0.32 to 7.50
Morgan Offshore Wind Project Generation Assets	0	1254	241	0.001	0.035 [a]	0.001	0.00 to 0.00	0.13 to 3.07	0.00 to 0.02	0.13 to 3.09
Rampion Offshore Wind Farm	0	33	0	0.001	No connectivity	0.001	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Rampion 2 Offshore Wind Farm	0	0	0	0.001	No connectivity	0.001	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Walney (3 and 4) Extension Offshore Wind Farm	0	588	203	0.001	0.035 [d]	0.001	0.00 to 0.00	0.06 to 1.44	0.00 to 0.01	0.06 to 1.45
West of Duddon Sands Offshore Wind Farm	1	544	2	0.001	0.035 [d]	0.001	0.00 to 0.00	0.06 to 1.33	0.00 to 0.00	0.06 to 1.33
West of Orkney Windfarm	0	8	2	0.001	No connectivity	0.001	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
White Cross Offshore Windfarm	7611	33	14	0.001	0.0002 [a]	0.001	0.02 to 0.53	0.00 to 0.00	0.00 to 0.00	0.02 to 0.53
Gap-filled projects										
Barrow Offshore Wind Farm	0	2	0	0.001	0.035 [d]	0.001	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Burbo Bank Offshore Wind Farm	0	2	1	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Gwynt Y Môr Offshore Wind Farm	1	13	2	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.01
North Hoyle Offshore Wind Farm	0	2	0	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Robin Rigg Offshore Wind Farm	0	3	1	0.001	0.035 [d]	0.001	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00 to 0.01
Rhyl Flats	0	4	1	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Walney 1 & 2 Offshore Wind Farms	1	14	3	0.001	0.035 [d]	0.001	0.00 to 0.00	0.00 to 0.03	0.00 to 0.00	0.00 to 0.03
Total predicted impact (adult birds)							**0.03 to 0.67**	**0.79 to 18.33**	**0.01 to 0.19**	**0.82 to 19.19**
Increase in baseline mortality (%)							**0.00% to 0.05%**	**0.06% to 1.45%**	**0.00% to 0.01%**	**0.07% to 1.52%**

1.4.3.66 As the predicted impact on Manx shearwater from Copeland Island SPA is <1% increase in baseline mortality, therefore, it is concluded beyond reasonable scientific doubt that there would be no AEoSI from the Mona Offshore Wind Project in-combination with other plans and projects, the impact is not considered to hinder the conservation objects of the site and, therefore, it is concluded beyond reasonable scientific doubt that there would be no AEoSI from the Mona Offshore Wind Project in-combination with other plans and projects.

1.4.3.67 Two matrix tables are presented to indicate the varying potential impacts on Manx shearwater from Copeland Island SPA, one (Table 1.88) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.89) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for Manx shearwater. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.89 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.5).

Table 1.88: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Copeland Islands SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	0	1	1	1	1	2	3
5%	0	0	0	1	1	1	3	4	5	7	10	14
10%	0	1	1	1	1	3	5	8	11	14	21	27
20%	1	1	2	2	3	5	11	16	22	27	41	55
30%	1	2	2	3	4	8	16	25	33	41	62	82
40%	1	2	3	4	5	11	22	33	44	55	82	110
50%	1	3	4	5	7	14	27	41	55	69	103	137
60%	2	3	5	7	8	16	33	49	66	82	123	164
70%	2	4	6	8	10	19	38	58	77	96	144	192
80%	2	4	7	9	11	22	44	66	88	110	164	219
90%	2	5	7	10	12	25	49	74	99	123	185	247
100%	3	5	8	11	14	27	55	82	110	137	206	274

Table 1.89: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Copeland Islands SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.04%	0.07%	0.09%	0.11%	0.16%	0.22%
5%	0.01%	0.02%	0.03%	0.04%	0.05%	0.11%	0.22%	0.33%	0.43%	0.54%	0.82%	1.09%
10%	0.02%	0.04%	0.07%	0.09%	0.11%	0.22%	0.43%	0.65%	0.87%	1.09%	1.63%	2.17%
20%	0.04%	0.09%	0.13%	0.17%	0.22%	0.43%	0.87%	1.30%	1.74%	2.17%	3.26%	4.35%
30%	0.07%	0.13%	0.20%	0.26%	0.33%	0.65%	1.30%	1.96%	2.61%	3.26%	4.89%	6.52%
40%	0.09%	0.17%	0.26%	0.35%	0.43%	0.87%	1.74%	2.61%	3.48%	4.35%	6.52%	8.69%
50%	0.11%	0.22%	0.33%	0.43%	0.54%	1.09%	2.17%	3.26%	4.35%	5.43%	8.15%	10.87%
60%	0.13%	0.26%	0.39%	0.52%	0.65%	1.30%	2.61%	3.91%	5.22%	6.52%	9.78%	13.04%
70%	0.15%	0.30%	0.46%	0.61%	0.76%	1.52%	3.04%	4.56%	6.09%	7.61%	11.41%	15.22%
80%	0.17%	0.35%	0.52%	0.70%	0.87%	1.74%	3.48%	5.22%	6.96%	8.69%	13.04%	17.39%
90%	0.20%	0.39%	0.59%	0.78%	0.98%	1.96%	3.91%	5.87%	7.83%	9.78%	14.67%	19.56%
100%	0.22%	0.43%	0.65%	0.87%	1.09%	2.17%	4.35%	6.52%	8.69%	10.87%	16.30%	21.74%

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.4.3.68 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in Manx shearwater baseline mortality from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, an in-combination assessment is presented within Table 1.90 (30-70% displacement and 1-10% mortality).

Table 1.90: In-combination assessment for Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

a – the apportioning value during the breeding season was taken from project specific documentation

b – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.4436.

c – the apportioning value during the breeding season has used that of Erebus Floating Wind Demo, specifically 0.995.

d – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.752.

e – During the breeding season age-class proportion are not able to be calculated due to the inability to age Manx shearwater on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 62.77% of birds are adults in the pre-breeding and post-breeding periods.

f – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project Generation Assets, specifically 0.983.

Project	Un-apportioned abundances (adult birds) [e]			Apportioning values			Apportioned displacement impact values (30-70% displacement 1-10% mortality)			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	111	26	134	0.7054	0.4436 [a]	0.7054	0.24 to 5.49	0.03 to 0.81	0.28 to 6.63	0.55 to 12.93
Burbo Bank Extension Offshore Wind Farm	0	444	1	0.7054	0.4436 [b]	0.7054	0.00 to 0.00	0.59 to 13.79	0.00 to 0.03	0.59 to 13.82
Erebus Floating Wind Demo	11	1,540	350	0.7054	0.995 [a]	0.7054	0.02 to 0.56	4.60 to 107.26	0.74 to 17.26	5.36 to 125.08
TwinHub (Wave Hub Floating Wind Farm)	0	1,270	2	0.7054	0.983 [f]	0.7054	0.00 to 0.00	3.75 to 87.39	0.00 to 0.09	3.75 to 87.48
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	795	3,434	17	0.7054	0.983 [f]	0.7054	1.68 to 39.27	10.13 to 236.29	0.04 to 0.84	11.85 to 276.40
Mona Offshore Wind Project	2	1,249	10	0.7054	0.7497 [a]	0.7054	0.00 to 0.09	2.81 to 65.55	0.02 to 0.50	2.83 to 66.14
Morecambe Offshore Windfarm Generation Assets	1,015	4,705	1,663	0.7054	0.7654 [a]	0.7054	2.15 to 50.12	10.80 to 252.08	3.52 to 82.14	16.47 to 384.34
Morgan Offshore Wind Project Generation Assets	0	1,254	241	0.7054	0.752 [a]	0.7054	0.00 to 0.00	2.83 to 66.01	0.51 to 11.90	3.34 to 77.91
Ormonde Wind Farm	0	1,001	1	0.7054	0.752 [d]	0.7054	0.00 to 0.00	2.26 to 52.69	0.00 to 0.03	2.26 to 52.72
Rampion Offshore Wind Farm	0	33	0	0.7054	No connectivity	0.7054	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Rampion 2 Offshore Wind Farm	0	0	0	0.7054	No connectivity	0.7054	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00
Walney (3 and 4) Extension Offshore Wind Farm	0	588	203	0.7054	0.752 [d]	0.7054	0.00 to 0.00	1.33 to 30.95	0.43 to 10.04	1.76 to 40.99
West of Duddon Sands Offshore Wind Farm	1	544	2	0.7054	0.752 [d]	0.7054	0.00 to 0.03	1.23 to 28.64	0.00 to 0.09	1.23 to 28.76
West of Orkney Windfarm	0	8	2	0.7054	No connectivity	0.7054	0.00 to 0.00	-	0.00 to 0.09	0.00 to 0.09
White Cross Offshore Windfarm	7,611	33	14	0.7054	0.6032 [a]	0.7054	16.11 to 375.84	0.06 to 1.39	0.03 to 0.68	16.20 to 377.92
Gap-filled projects										
Barrow Offshore Wind Farm	0	2	0	0.001	0.752 [d]	0.001	0.00 to 0.00	0.00 to 0.11	0.00 to 0.00	0.00 to 0.11
Burbo Bank Offshore Wind Farm	0	2	1	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.00 to 0.06	0.00 to 0.03	0.00 to 0.09
Gwynt Y Môr Offshore Wind Farm	1	13	2	0.001	0.0059 [b]	0.001	0.00 to 0.03	0.02 to 0.40	0.00 to 0.09	0.02 to 0.53
North Hoyle Offshore Wind Farm	0	2	0	0.7054	0.4436 [a]	0.7054	0.00 to 0.00	0.00 to 0.06	0.00 to 0.00	0.00 to 0.06
Robin Rigg Offshore Wind Farm	0	3	1	0.001	0.752 [d]	0.001	0.00 to 0.00	0.01 to 0.16	0.00 to 0.03	0.01 to 0.19
Rhyl Flats	0	4	1	0.001	0.0059 [b]	0.001	0.00 to 0.00	0.01 to 0.12	0.00 to 0.03	0.01 to 0.16
Walney 1 & 2 Offshore Wind Farms	1	14	3	0.001	0.752 [d]	0.001	0.00 to 0.03	0.03 to 0.74	0.01 to 0.12	0.04 to 0.89
Total predicted impact (adult birds)							**20.21 to 471.46**	**40.48 to 944.51**	**5.60 to 130.64**	**66.28 to 1546.61**
Increase in baseline mortality (%)							**0.02% to 0.40%**	**0.03% to 0.80%**	**0.00% to 0.11%**	**0.06% to 1.31%**

1.4.3.69 As the predicted impact on Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is <1% increase in baseline mortality, which is likely to be undetectable against natural variation, the impact is not considered to hinder the conservation objects of the site, and therefore, it is concluded beyond reasonable scientific doubt that there would be no AEoSI from the Mona Offshore Wind Project in-combination with other plans and projects.

1.4.3.70 Two matrix tables are presented to indicate the varying potential impacts on Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, one (Table 1.91) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.92) indicating the percentage increase in baseline mortality. The

colours used within the matrix table highlight different scenarios considered regarding predicted displacement impacts for Manx shearwater. Cells highlighted blue represent the range of displacement scenarios considered by NRW (A) and the JNCC (30-70% displacement rates and 1-10% mortality rates) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.92 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.5).

Table 1.91: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	2	4	7	9	11	22	44	66	88	110	133	166
5%	11	22	33	44	55	110	221	331	442	552	663	829
10%	22	44	66	88	110	221	442	663	884	1,105	1,326	1,657
20%	44	88	133	177	221	442	884	1,326	1,768	2,209	2,651	3,314
30%	66	133	199	265	331	663	1,326	1,988	2,651	3,314	3,977	4,971
40%	88	177	265	354	442	884	1,768	2,651	3,535	4,419	5,303	6,628
50%	110	221	331	442	552	1,105	2,209	3,314	4,419	5,524	6,628	8,285
60%	133	265	398	530	663	1,326	2,651	3,977	5,303	6,628	7,954	9,942
70%	155	309	464	619	773	1,547	3,093	4,640	6,186	7,733	9,280	11,600
80%	177	354	530	707	884	1,768	3,535	5,303	7,070	8,838	10,605	13,257
90%	199	398	597	795	994	1,988	3,977	5,965	7,954	9,942	11,931	14,914
100%	221	442	663	884	1,105	2,209	4,419	6,628	8,838	11,047	13,257	16,571

Table 1.92: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on Manx shearwater from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.04%	0.06%	0.07%	0.09%	0.11%	0.14%
5%	0.01%	0.02%	0.03%	0.04%	0.05%	0.09%	0.19%	0.28%	0.37%	0.47%	0.56%	0.70%
10%	0.02%	0.04%	0.06%	0.07%	0.09%	0.19%	0.37%	0.56%	0.75%	0.93%	1.12%	1.40%
20%	0.04%	0.07%	0.11%	0.15%	0.19%	0.37%	0.75%	1.12%	1.49%	1.87%	2.24%	2.80%
30%	0.06%	0.11%	0.17%	0.22%	0.28%	0.56%	1.12%	1.68%	2.24%	2.80%	3.36%	4.20%
40%	0.07%	0.15%	0.22%	0.30%	0.37%	0.75%	1.49%	2.24%	2.99%	3.73%	4.48%	5.60%
50%	0.09%	0.19%	0.28%	0.37%	0.47%	0.93%	1.87%	2.80%	3.73%	4.67%	5.60%	7.00%
60%	0.11%	0.22%	0.34%	0.45%	0.56%	1.12%	2.24%	3.36%	4.48%	5.60%	6.72%	8.40%
70%	0.13%	0.26%	0.39%	0.52%	0.65%	1.31%	2.61%	3.92%	5.23%	6.53%	7.84%	9.80%
80%	0.15%	0.30%	0.45%	0.60%	0.75%	1.49%	2.99%	4.48%	5.97%	7.47%	8.96%	11.20%
90%	0.17%	0.34%	0.50%	0.67%	0.84%	1.68%	3.36%	5.04%	6.72%	8.40%	10.08%	12.60%
100%	0.19%	0.37%	0.56%	0.75%	0.93%	1.87%	3.73%	5.60%	7.47%	9.34%	11.20%	14.00%

Northern gannet

Ailsa Craig SPA

1.4.3.71 As the combined displacement and collision impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in northern gannet baseline mortality from Alisa Craig SPA, an in-combination assessment is presented within

1.4.3.72 Table **1.93** (60-80% displacement and 1-10% mortality plus collision using the species-group avoidance rate The in-combination assessment for northern gannet from Ailsa Craig SPA does not account for macro-avoidance due to the way collisions estimates are calculated. To apply macro-avoidance, the SNCB advice is to reduce the input densities for the collision risk models rather than multiply the predicted impacts by 30% (i.e. a 70% reduction in the impact). As older projects considered within the in-combination assessment did not take into account macro-avoidance and to enable a consistent approach, the in-combination assessment presented here does not account for macro-avoidance and therefore should be seen as precautionary, with any impact actually being less than presented here.

Table 1.93: In-combination assessment for northern gannet from the Ailsa Craig SPA.

a – During the breeding season site-specific age-class values have been used for Awel y Mor (93.5%), Erebus Floating Wind Project (99.0%), Llŷr Floating Offshore Wind Project (95.99%), Mona Offshore Wind Project (93.58%), Morecambe Generation Assets (73.3%) and Morgan Generation Assets (94.94%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 59.16% of birds are adults in the pre-breeding period and 58.25% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.568.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.462.

e – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and no macro-avoidance)[e]			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	0	328	201	0.00	10.88	2.53	0.1386	0.462[b]	0.1706	0.00 to 0.00	0.85 to 11.33	0.12 to 1.60	0.00	4.70	0.25	0.00 to 0.00	5.55 to 16.03	0.37 to 1.85	5.92 to 17.88
Burbo Bank Extension Offshore Wind Farm	25	648	22	0.00	12.44	0.00	0.1386	0.462 [d]	0.1706	0.01 to 0.16	1.80 to 23.95	0.01 to 0.17	0.00	5.75	0.00	0.01 to 0.16	7.54 to 29.70	0.01 to 0.17	7.57 to 30.03
Erebus Floating Wind Demo	100	224	334	0.61	3.37	0.61	0.1386	No connectivity	0.1706	0.05 to 0.66	-	0.20 to 2.66	0.05	-	0.06	0.10 to 0.71	-	0.26 to 2.72	0.36 to 3.42
TwinHub (Wave Hub Floating Wind Farm)	0	244	153	0.00	26.12	0.00	0.1386	No connectivity	0.1706	0.00 to 0.00	-	0.09 to 1.22	0.00	-	0.00	0.00 to 0.00	-	0.09 to 1.22	0.09 to 1.22
Llŷr 1 Floating Offshore Wind Farm	65	246	715	0.30	3.00	0.50	0.1386	0.007	0.1706	0.03 to 0.43	0.01 to 0.13	0.43 to 5.68	0.02	0.02	0.05	0.06 to 0.45	0.03 to 0.15	0.48 to 5.73	0.56 to 6.34
Ormonde Wind Farm	2	110	3	0.00	6.72	0.00	0.1386	0.568[c]	0.1706	0.01 to 0.18	0.79 to 10.56	0.03 to 0.46	0.03	2.49	0.05	0.05 to 0.22	3.28 to 13.05	0.09 to 0.51	3.41 to 13.78
Mona Offshore Wind Project	28	251	58	0.41	4.73	0.51	0.1386	0.562[b]	0.1706	0.00 to 0.05	1.21 to 16.11	0.07 to 0.99	0.00	0.46	0.00	0.01 to 0.05	1.67 to 16.57	0.07 to 0.99	1.75 to 17.61
Morecambe Offshore Windfarm Generation Assets	8	541	124	0.02	1.24	0.00	0.1386	0.5078[b]	0.1706	0.02 to 0.23	0.50 to 6.64	0.04 to 0.52	0.00	0.21	0.01	0.02 to 0.23	0.71 to 6.85	0.04 to 0.52	0.77 to 7.61
Morgan Offshore Wind Project Generation Assets	35	154	65	0.00	0.39	0.06	0.1386	0.568[b]	0.1706	0.00 to 0.02	0.68 to 9.04	0.00 to 0.05	0.00	3.82	0.00	0.00 to 0.02	4.50 to 12.86	0.00 to 0.05	4.50 to 12.93
Walney (3 and 4) Extension Offshore Wind Farm	24	150	259	0.92	16.30	16.56	0.1386	0.568[c]	0.1706	0.01 to 0.16	0.51 to 6.82	0.15 to 2.06	0.08	9.26	1.65	0.09 to 0.23	9.77 to 16.07	1.80 to 3.70	11.66 to 20.01
West of Duddon Sands Offshore Wind Farm	11	431	18	0.26	1.96	0.33	0.1386	0.568[c]	0.1706	0.01 to 0.07	1.47 to 19.58	0.01 to 0.14	0.02	1.11	0.03	0.03 to 0.09	2.58 to 20.70	0.04 to 0.18	2.65 to 20.97
West of Orkney Windfarm	59	958	1,171	2.10	33.80	12.92	0.1386	0.0003[b]	0.1706	0.03 to 0.39	0.00 to 0.02	0.70 to 9.31	0.17	0.01	1.28	0.20 to 0.56	0.01 to 0.03	1.98 to 10.59	2.20 to 11.19
White Cross Offshore Windfarm	141	239	76	0.00	4.42	1.69	0.1386	0.0112[b]	0.1706	0.07 to 0.92	0.02 to 0.21	0.05 to 0.60	0.00	0.05	0.17	0.07 to 0.92	0.07 to 0.26	0.21 to 0.77	0.35 to 1.96
Gap-filled projects																			
Barrow Offshore Wind Farm	3	8	6	0.06	0.36	0.06	0.1386	0.568[c]	0.1706	0.00 to 0.02	0.03 to 0.36	0.00 to 0.05	0.00	0.20	0.01	0.01 to 0.02	0.23 to 0.57	0.01 to 0.05	0.25 to 0.65

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and no macro-avoidance)[e]			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Burbo Bank	3	6	5	0.06	0.36	0.06	0.1386	0.462[d]	0.1706	0.00 to 0.02	0.02 to 0.22	0.00 to 0.04	0.00	0.17	0.01	0.01 to 0.02	0.18 to 0.39	0.01 to 0.05	0.20 to 0.46
Gwynt Y Môr Offshore Wind Farm	13	27	20	1.02	7.30	1.24	0.1386	0.462[d]	0.1706	0.01 to 0.09	0.07 to 1.00	0.01 to 0.16	0.08	3.37	0.12	0.09 to 0.17	3.45 to 4.37	0.14 to 0.28	3.67 to 4.82
North Hoyle Offshore Wind Farm	3	7	5	0.10	0.74	0.13	0.1386	0.462[d]	0.1706	0.00 to 0.02	0.02 to 0.30	0.00 to 0.04	0.01	0.42	0.01	0.01 to 0.03	0.44 to 0.72	0.02 to 0.05	0.47 to 0.80
Robin Rigg Offshore Wind Farm	4	11	7	0.09	0.70	0.12	0.1386	0.568[c]	0.1706	0.00 to 0.03	0.04 to 0.50	0.00 to 0.06	0.01	0.40	0.01	0.01 to 0.03	0.44 to 0.90	0.02 to 0.07	0.46 to 1.00
Rhyl Flats Offshore Wind Farm	4	8	6	0.40	1.04	0.18	0.1386	0.462[c]	0.1706	0.00 to 0.03	0.02 to 0.30	0.00 to 0.05	0.03	0.48	0.02	0.03 to 0.06	0.50 to 0.78	0.02 to 0.07	0.56 to 0.90
Walney 1 Offshore Wind Farm and 2	15	36	26	0.26	1.91	0.32	0.1386	0.568[d]	0.1706	0.01 to 0.10	0.12 to 1.64	0.02 to 0.21	0.02	1.08	0.03	0.03 to 0.12	1.21 to 2.72	0.05 to 0.24	1.28 to 3.08
Total predicted impact (adult birds)										**0.27 to 3.57**	**8.16 to 108.73**	**1.95 to 26.05**	**0.54**	**34.00**	**3.76**	**0.81 to 4.11**	**42.16 to 142.73**	**5.71 to 29.81**	**48.68 to 176.65**
Increase in baseline mortality (%)										**0.00% to 0.07%**	**0.15% to 2.02%**	**0.04% to 0.48%**	**0.01%**	**0.63%**	**0.07%**	**0.02% to 0.08%**	**0.78% to 2.65%**	**0.11% to 0.55%**	**0.90% to 3.28%**

1.4.3.73 As the predicted combined displacement and collision impact on northern gannet from Ailsa Craig SPA is >1% increase in baseline mortality, the impact is further investigated by a PVA (see section 1.5.4) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.74 Two matrix tables are presented to indicate the varying potential impacts on northern gannet from Ailsa Craig SPA, one (Table 1.94) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.95) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted impacts for northern gannet. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (1-10% mortality and 60-80% displacement) and the single cell highlighted green represents the displacement scenario (70% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.95 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.4).

Table 1.94: Matrix table showing the number of birds for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Ailsa Craig SPA.

Northern gannet (Annual – number of adults)		Mortality rate (%) 1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	10%	40	42	43	45	47	56	82	125	168	211
	20%	42	45	49	52	56	73	125	211	298	384
	30%	43	49	54	59	64	90	168	298	427	557
	40%	45	52	59	66	73	107	211	384	557	730
	50%	47	56	64	73	82	125	254	471	687	903
	60%	49	59	69	80	90	142	298	557	816	1,076
	70%	50	63	75	87	99	159	341	644	946	1,249
	80%	52	66	80	94	107	177	384	730	1,076	1,422
	90%	54	69	85	101	116	194	427	816	1,206	1,595
	100%	56	73	90	107	125	211	471	903	1,335	1,768

Table 1.95: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Ailsa Craig SPA (red text indicates >1%).

Northern gannet (Annual – increase in baseline mortality)		Mortality rate (%) 1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	10%	0.74%	0.78%	0.81%	0.84%	0.87%	1.03%	1.51%	2.32%	3.12%	3.92%
	20%	0.78%	0.84%	0.90%	0.97%	1.03%	1.35%	2.32%	3.92%	5.53%	7.14%
	30%	0.81%	0.90%	1.00%	1.10%	1.19%	1.68%	3.12%	5.53%	7.94%	10.35%

40%	0.84%	0.97%	1.10%	1.23%	1.35%	2.00%	3.92%	7.14%	10.35%	13.56%
50%	0.87%	1.03%	1.19%	1.35%	1.51%	2.32%	4.73%	8.74%	12.76%	16.78%
60%	0.90%	1.10%	1.29%	1.48%	1.68%	2.64%	5.53%	10.35%	15.17%	19.99%
70%	0.94%	1.16%	1.39%	1.61%	1.84%	2.96%	6.33%	11.96%	17.58%	23.20%
80%	0.97%	1.23%	1.48%	1.74%	2.00%	3.28%	7.14%	13.56%	19.99%	26.41%
90%	1.00%	1.29%	1.58%	1.87%	2.16%	3.60%	7.94%	15.17%	22.40%	29.63%
100%	1.03%	1.35%	1.68%	2.00%	2.32%	3.92%	8.74%	16.78%	24.81%	32.84%

Grassholm SPA

1.4.3.75 As the combined displacement and collision impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in baseline mortality for northern gannet from Grassholm SPA, an in-combination assessment is presented within Table 1.96 (60-80% displacement and 1-10% mortality plus collisions using the species-group avoidance rate). The in-combination assessment for northern gannet from Grassholm SPA does not account for macro-avoidance due to the way collision estimates are calculated. To apply macro-avoidance, the SNCB advice is to reduce the input densities for the collision risk models rather than multiply the predicted outputs by 30% (i.e. a 70% reduction in the impact). As older projects considered within the in-combination assessment did not take into account macro-avoidance and to enable a consistent approach, the in-combination assessment presented here does not account for macro-avoidance and therefore should be seen as precautionary, with any impact actually being less than presented here. However, for Grassholm SPA, the Applicant presented an assessment as advised by NRW (A) which did account for macro-avoidance at Deadline 6 (see Revised Assessment for Northern Gannet at Grassholm SPA (Document Reference S_D6_9)). These additional in-combination assessment tables and PVAs presented in Appendix B: for completeness.

Table 1.96: In-combination assessment for northern gannet from the Grassholm SPA.

a – During the breeding season site-specific age-class values have been used for Awel y Mor (93.5%), Erebus Floating Wind Project (99.0%), Llŷr Floating Offshore Wind Project (95.99%), Mona Offshore Wind Project (93.58%), Morecambe Generation Assets (73.3%) and Morgan Generation Assets (94.94%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 59.16% of birds are adults in the pre-breeding period and 58.25% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.258.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.367.

e – the apportioning value during the breeding seas has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.969.

f – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds [a])			Un-apportioned collision impacts (adult birds [a]) [f]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 1-10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and no macro-avoidance)[f]			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	0	307	117	0.00	10.17	1.40	0.2007	0.367[b]	0.2471	0.00 to 0.00	0.68 to 9.00	0.17 to 2.31	0.00	3.73	0.36	0.00 to 0.00	4.41 to 12.74	0.54 to 2.68	4.95 to 15.42
Burbo Bank Extension Offshore Wind Farm	15	648	13	0.00	12.44	0.00	0.2007	0.367[d]	0.2471	0.02 to 0.24	1.43 to 19.03	0.02 to 0.25	0.00	4.56	0.00	0.02 to 0.24	5.99 to 23.59	0.02 to 0.25	6.03 to 24.08
Erebus Floating Wind Project	59	222	195	0.34	3.34	0.34	0.2007	0.995[b]	0.2471	0.07 to 0.95	1.32 to 17.65	0.29 to 3.85	0.07	3.32	0.09	0.14 to 1.02	4.64 to 20.97	0.38 to 3.93	5.16 to 25.93
TwinHub (Wave Hub Floating Wind Farm)	0	244	89	0.00	26.12	0.00	0.2007	0.969[e]	0.2471	0.00 to 0.00	1.46 to 18.91	0.13 to 1.76	0.00	25.31	0.00	0.00 to 0.00	27.45 to 44.23	0.13 to 1.76	26.86 to 45.99
Llŷr 1 Floating Offshore Wind Farm	38	236	416	0.18	2.88	0.29	0.2007	0.969[b]	0.2471	0.05 to 0.62	1.37 to 18.31	0.62 to 8.23	0.04	2.79	0.07	0.08 to 0.65	4.16 to 21.10	0.69 to 8.31	4.93 to 30.05
Mona Offshore Wind Project	17	235	34	0.23	4.43	0.28	0.2007	0.176[b]	0.2471	0.02 to 0.27	0.25 to 3.31	0.05 to 0.67	0.05	0.78	0.07	0.07 to 0.31	1.03 o 4.09	0.12 to 0.74	1.22 to 5.14
Morecambe Offshore Windfarm Generation Assets	5	397	72	0.00	0.91	0.01	0.2007	0.3141[b]	0.2471	0.01 to 0.08	0.75 to 9.96	0.11 to 1.43	0.00	0.29	0.00	0.01 to 0.08	1.03 to 10.25	0.11 to 1.43	1.15 to 11.76
Morgan Offshore Wind Project Generation Assets	21	139	38	0.00	1.08	0.12	0.2007	0.258[b]	0.2471	0.02 to 0.33	0.21 to 2.86	0.06 to 0.75	0.00	0.28	0.03	0.02 to 0.33	0.49 to 3.14	0.08 to 0.78	0.60 to 4.25
Ormonde Wind Farm	2	199	3	0.00	6.72	0.00	0.2007	0.258[c]	0.2471	0.00 to 0.03	0.31 to 4.11	0.01 to 0.07	0.00	1.73	0.00	0.00 to 0.03	2.04 to 5.84	0.01 to 0.07	2.05 to 5.94
Walney (3 and 4) Extension Offshore Wind Farm	14	150	151	0.51	16.30	9.15	0.2007	0.258[c]	0.2471	0.02 to 0.23	0.23 to 3.10	0.22 to 2.98	0.11	4.20	2.38	0.13 to 0.34	4.44 to 7.30	2.61 to 5.37	7.17 to 13.00
West of Duddon Sands Offshore Wind Farm	7	431	10	0.14	1.96	0.18	0.2007	0.258[c]	0.2471	0.01 to 0.10	0.67 to 8.90	0.02 to 0.21	0.03	0.51	0.05	0.04 to 0.14	1.17 to 9.40	0.06 to 0.25	1.27 to 9.79

Project	Un-apportioned abundances (adult birds [a])			Un-apportioned collision impacts (adult birds [a]) [f]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 1-10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and no macro-avoidance)[f]			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
West of Orkney Windfarm	35	958	682	1.16	33.80	7.14	0.2007	No connectivity	0.2471	0.04 to 0.56	-	1.01 to 13.48	0.25	-	1.86	0.29 to 0.81	-	2.87 to 15.34	3.16 to 16.15
White Cross Offshore Windfarm	83	239	44	0.00	4.42	0.93	0.2007	0.5208[b]	0.2471	0.10 to 1.34	0.75 to 9.96	0.07 to 0.88	0.00	2.30	0.24	0.10 to 1.34	3.05 to 12.26	0.31 to 1.12	3.46 to 14.72
Gap-filled projects																			
Barrow Offshore Wind Farm	0	2	1	0.04	0.36	0.03	0.2007	0.258[b]	0.2471	0.00 to 0.03	0.01 to 0.17	0.01 to 0.07	0.01	0.09	0.01	0.01 to 0.04	0.11 to 0.26	0.01 to 0.08	0.13 to 0.37
Burbo Bank	2	6	3	0.03	0.36	0.03	0.2007	0.367[d]	0.2471	0.00 to 0.03	0.01 to 0.18	0.00 to 0.06	0.01	0.13	0.01	0.01 to 0.04	0.15 to 0.31	0.01 to 0.07	0.17 to 0.41
Gwynt Y Môr Offshore Wind Farm	8	27	12	0.56	7.30	0.69	0.2007	0.367[d]	0.2471	0.01 to 0.12	0.06 to 0.79	0.02 to 0.23	0.12	2.68	0.18	0.13 to 0.24	2.74 to 3.47	0.20 to 0.41	3.06 to 4.13
North Hoyle Offshore Wind Farm	0	3	1	0.06	0.74	0.08	0.2007	0.367[d]	0.2471	0.00 to 0.03	0.02 to 0.20	0.00 to 0.06	0.01	0.27	0.02	0.01 to 0.04	0.29 to 0.47	0.02 to 0.08	0.32 to 0.58
Robin Rigg Offshore Wind Farm	2	11	4	0.05	0.70	0.07	0.2007	0.258[c]	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.08	0.01	0.18	0.02	0.01 to 0.05	0.20 to 0.41	0.02 to 0.10	0.23 to 0.55
Rhyl Flats Offshore Wind Farm	2	8	3	0.22	1.04	0.10	0.2007	0.367[d]	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.07	0.05	0.38	0.03	0.05 to 0.09	0.40 to 0.62	0.03 to 0.09	0.48 to 0.80
Walney 1 Offshore Wind Farm and 2	9	36	15	0.14	1.91	0.18	0.2007	0.258[c]	0.2471	0.01 to 0.14	0.06 to 0.74	0.02 to 0.30	0.03	0.49	0.05	0.04 to 0.17	0.55 to 1.24	0.07 to 0.35	0.66 to 1.75
Total predicted impact (adult birds)										**0.39 to 5.17**	**9.58 to 127.78**	**2.83 to 37.73**	**0.78**	**53.86**	**5.44**	**1.17 to 5.95**	**63.44 to 181.64**	**8.27 to 43.18**	**72.89 to 230.77**
Increase in baseline mortality (%) (baseline mortality of 5,834)										**0.01% to 0.09%**	**0.16% to 2.19%**	**0.05% to 0.65%**	**0.01%**	**0.93%**	**0.09%**	**0.02% to 0.10%**	**1.09% to 3.11%**	**0.14% to 0.74%**	**1.25% to 3.96%**

1.4.3.76 As the predicted combined displacement and collision impact on northern gannet from Grasholm SPA is predicted to be >1% increase in baseline mortality, the impact is further investigated by a PVA (see section 1.5.4) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.77 Two matrix tables are presented to indicate the varying potential impacts on northern gannet from Ailsa Craig SPA, one (Table 1.97) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.98) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted impacts for northern gannet. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (1-10% mortality and 60-80% displacement) and the single cell highlighted green represents the displacement scenario (70% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.98 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.4).

Table 1.97: Matrix table showing the number of birds for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Grassholm SPA.

Northern gannet (Annual – number of adults)		Mortality rate (%) 1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	10%	62	64	66	69	71	81	113	167	220	273
	20%	64	69	73	77	81	103	167	273	380	487
	30%	66	73	79	86	92	124	220	380	540	700
	40%	69	77	86	94	103	145	273	487	700	914
	50%	71	81	92	103	113	167	327	594	860	1,127
	60%	73	86	98	111	124	188	380	700	1,020	1,340
	70%	75	90	105	120	135	209	433	807	1,180	1,554
	80%	77	94	111	128	145	231	487	914	1,340	1,767
	90%	79	98	118	137	156	252	540	1,020	1,500	1,980
	100%	81	103	124	145	167	273	594	1,127	1,660	2,194

Table 1.98: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Grassholm SPA (red text indicates >1%).

Northern gannet (Annual – increase in baseline mortality)		Mortality rate (%) 1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	10%	1.07%	1.10%	1.14%	1.18%	1.21%	1.40%	1.94%	2.86%	3.77%	4.69%
	20%	1.10%	1.18%	1.25%	1.32%	1.40%	1.76%	2.86%	4.69%	6.52%	8.34%
	30%	1.14%	1.25%	1.36%	1.47%	1.58%	2.13%	3.77%	6.52%	9.26%	12.00%
	40%	1.18%	1.32%	1.47%	1.62%	1.76%	2.49%	4.69%	8.34%	12.00%	15.66%
	50%	1.21%	1.40%	1.58%	1.76%	1.94%	2.86%	5.60%	10.17%	14.75%	19.32%
	60%	1.25%	1.47%	1.69%	1.91%	2.13%	3.22%	6.52%	12.00%	17.49%	22.97%
	70%	1.29%	1.54%	1.80%	2.05%	2.31%	3.59%	7.43%	13.83%	20.23%	26.63%
	80%	1.32%	1.62%	1.91%	2.20%	2.49%	3.96%	8.34%	15.66%	22.97%	30.29%
	90%	1.36%	1.69%	2.02%	2.35%	2.68%	4.32%	9.26%	17.49%	25.72%	33.95%
	100%	1.40%	1.76%	2.13%	2.49%	2.86%	4.69%	10.17%	19.32%	28.46%	37.60%

Saltee Islands SPA

1.4.3.78 As the combined displacement and collision impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in northern gannet baseline mortality from Saltee Islands SPA, an in-combination assessment is presented within Table 1.99 (60-80% displacement and 1-10% mortality plus collisions using the species-group avoidance rate). The in-combination assessment for northern gannet from Saltee Islands SPA does not account for macro-avoidance due to the way collision estimates are calculated. To apply macro-avoidance, the SNCB advice is to reduce the input densities for the collision risk models rather than multiply the predicted impacts by 30% (i.e. a 70% reduction in the impact). As older projects considered within the in-combination assessment did not take into account macro-avoidance and to enable a consistent approach, the in-combination assessment presented here does not account for macro-avoidance and therefore should be seen as precautionary, with any impact actually being less than presented here.

Table 1.99: In-combination assessment for northern gannet from the Saltee Islands SPA.

a – During the breeding season site-specific age-class values have been used for Awel y Mor (93.5%), Erebus Floating Wind Project (99.0%), Llŷr Floating Offshore Wind Project (95.99%), Mona Offshore Wind Project (93.58%), Morecambe Generation Assets (73.3%) and Morgan Generation Assets (94.94%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 59.16% of birds are adults in the pre-breeding period and 58.25% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.032.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.021.

e – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.014.

f – the Applicant has presented the collision impacts using a 99.28% avoidance rate, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and no macro-avoidance)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	0	328	201	0.00	10.88	2.53	0.0015	0.021[b]	0.0015	0.00 to 0.00	0.04 to 0.52	0.00 to 0.01	0.00	0.21	0.00	0.00 to 0.00	0.25 to 0.73	0.00 to 0.02	0.26 to 0.75
Burbo Bank Extension Offshore Wind Farm	25	648	22	0.00	12.44	0.00	0.0015	0.021[d]	0.0015	0.00 to 0.00	0.08 to 1.09	0.00 to 0.00	0.00	0.26	0.00	0.00 to 0.00	0.34 to 1.35	0.00 to 0.00	0.34 to 1.35
Erebus Floating Wind Demo	100	224	334	0.61	3.37	0.61	0.0015	0.003[b]	0.0015	0.00 to 0.01	0.00 to 0.05	0.00 to 0.02	0.00	0.00	0.00	0.00 to 0.01	0.01 to 0.06	0.00 to 0.02	0.02 to 0.10
TwinHub (Wave Hub Floating Wind Farm)	0	244	153	0.00	26.12	0.00	0.0015	0.0014[e]	0.0015	0.00 to 0.00	0.02 to 0.27	0.00 to 0.01	0.00	0.00	0.00	0.00 to 0.00	0.39 to 0.64	0.00 to 0.01	0.39 to 0.65
Llŷr 1 Floating Offshore Wind Farm	65	246	715	0.30	3.00	0.50	0.0015	0.0014[b]	0.0015	0.00 to 0.00	0.02 to 0.26	0.00 to 0.05	0.00	0.04	0.00	0.00 to 0.00	0.06 to 0.30	0.00 to 0.05	0.06 to 0.36
Ormonde Wind Farm	3	199	6	0.00	6.72	0.00	0.0015	0.032[c]	0.0015	0.00 to 0.00	0.04 to 0.51	0.00 to 0.00	0.00	0.22	0.00	0.00 to 0.00	0.16 to 0.65	0.00 to 0.00	0.16 to 0.66
Mona Offshore Wind Project	28	251	58	0.41	4.73	0.51	0.0015	0.028[b]	0.0015	0.00 to 0.00	0.04 to 0.53	0.00 to 0.00	0.00	0.12	0.00	0.00 to 0.00	0.12 to 1.23	0.00 to 0.01	0.12 to 1.24

Project	Un-apportioned abundances (adult birds) [a]			Un-apportioned collision impacts (adult birds) [a]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and no macro-avoidance)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Morecambe Offshore Windfarm Generation Assets	8	541	124	0.02	1.24	0.00	0.0015	0.0377[b]	0.0015	0.00 to 0.00	0.09 to 1.20	0.00 to 0.01	0.00	0.03	0.00	0.00 to 0.00	0.04 to 0.39	0.00 to 0.00	0.04 to 0.39
Morgan Offshore Wind Project Generation Assets	35	154	65	0.00	0.39	0.06	0.0015	0.032[c]	0.0015	0.00 to 0.00	0.03 to 0.37	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.25 to 0.72	0.00 to 0.00	0.25 to 0.73
Walney (3 and 4) Extension Offshore Wind Farm	24	150	259	0.92	16.30	16.56	0.0015	0.032 [c]	0.0015	0.00 to 0.00	0.03 to 0.38	0.00 to 0.02	0.00	0.52	0.00	0.00 to 0.00	0.55 to 0.91	0.02 to 0.03	0.57 to 0.94
West of Duddon Sands Offshore Wind Farm	11	431	18	0.26	1.96	0.33	0.0015	0.032 [c]	0.0015	0.00 to 0.00	0.08 to 1.10	0.00 to 0.00	0.00	0.06	0.00	0.00 to 0.00	0.15 to 1.17	0.00 to 0.00	0.15 to 1.17
West of Orkney Windfarm	59	958	1,171	2.10	33.80	12.92	0.0015	No connectivity	0.0015	0.00 to 0.00	-	0.01 to 0.08	0.00	-	0.00	0.00 to 0.01	-	0.02 to 0.09	0.02 to 0.10
White Cross Offshore Windfarm	141	239	76	0.00	4.42	1.69	0.0015	0.0141[b]	0.0015	0.00 to 0.01	0.02 to 0.27	0.00 to 0.01	0.00	0.06	0.00	0.00 to 0.01	0.08 to 0.33	0.00 to 0.01	0.09 to 0.35
Gap-filled projects																			
Barrow Offshore Wind Farm	3	8	6	0.06	0.36	0.06	0.0015	0.032 [c]	0.0015	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.03	0.00 to 0.00	0.01 to 0.03
Burbo Bank	3	6	5	0.06	0.36	0.06	0.0015	0.021[d]	0.0015	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.01	0.00	0.00 to 0.00	0.01 to 0.02	0.00 to 0.00	0.01 to 0.02
Gwynt Y Môr Offshore Wind Farm	13	27	20	1.02	7.30	1.24	0.0015	0.021 [d]	0.0015	0.00 to 0.00	0.00 to 0.05	0.00 to 0.00	0.00	0.15	0.00	0.00 to 0.00	0.16 to 0.20	0.00 to 0.00	0.16 to 0.20
North Hoyle Offshore Wind Farm	3	7	5	0.10	0.74	0.13	0.0015	0.032 [c]	0.0015	0.00 to 0.00	0.00 to 0.02	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.03 to 0.04	0.00 to 0.00	0.03 to 0.04
Robin Rigg Offshore Wind Farm	4	11	7	0.09	0.70	0.12	0.0015	0.032 [c]	0.0015	0.00 to 0.00	0.00 to 0.03	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.02 to 0.05	0.00 to 0.00	0.02 to 0.05
Rhyl Flats Offshore Wind Farm	4	8	6	0.40	1.04	0.18	0.0015	0.021 [d]	0.0015	0.00 to 0.00	0.00 to 0.01	0.00 to 0.00	0.00	0.02	0.00	0.00 to 0.00	0.02 to 0.04	0.00 to 0.00	0.02 to 0.04
Walney 1 Offshore Wind Farm and 2	15	36	26	0.26	1.91	0.32	0.0015	0.032 [c]	0.0015	0.00 to 0.00	0.01 to 0.09	0.00 to 0.00	0.00	0.06	0.00	0.00 to 0.00	0.07 to 0.15	0.00 to 0.00	0.07 to 0.16
Total predicted impact (adult birds)										**0.00 to 0.04**	**0.51 to 6.78**	**0.02 to 0.23**	**0.01**	**2.22**	**0.03**	**0.01 to 0.04**	**2.73 to 9.01**	**0.05 to 0.26**	**2.79 to 9.32**
Increase in baseline mortality (%)										**0.00% to 0.01%**	**0.07% to 0.89%**	**0.00% to 0.03%**	**0.00%**	**0.29%**	**0.00%**	**0.00% to 0.01%**	**0.36% to 1.18%**	**0.01% to 0.03%**	**0.36% to 1.22%**

1.4.3.79 As the predicted impact on northern gannet from Saltee Islands SPA is predicted to be >1% increase in baseline mortality, the impact is further investigated by a PVA (see section 1.5.4) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.80 Two matrix tables are presented to indicate the varying potential impacts on northern gannet from Ailsa Craig SPA, one (Table 1.100) showing the number of adult birds impacted at a variety of displacement (10-100%) and mortality rates 10-100%) and one (Table 1.101) indicating the percentage increase in baseline mortality. . The colours used within the matrix table highlight the different scenarios considered regarding predicted impacts for northern gannet. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (1-10% mortality and 60-80% displacement) and the single cell highlighted green represents the displacement scenario (70% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.101 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.4).

Table 1.100: Matrix table showing the number of birds for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Saltee Islands SPA.

Northern gannet (Annual – number of adults)		Mortality rate (%) 1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	10%	2	2	3	3	3	3	4	7	9	11
	20%	2	3	3	3	3	4	7	11	15	20
	30%	3	3	3	3	4	5	9	15	22	29
	40%	3	3	3	4	4	6	11	20	29	38
	50%	3	3	4	4	4	7	13	24	35	46
	60%	3	3	4	4	5	8	15	29	42	55
	70%	3	3	4	5	5	8	18	33	49	64

80%	3	4	4	5	6	9	20	38	55	73
90%	3	4	5	5	6	10	22	42	62	82
100%	3	4	5	6	7	11	24	46	68	90

Table 1.101: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement and collisions on northern gannet from the Saltee Islands SPA (red text indicates >1%).

Northern gannet (Annual – increase in baseline mortality)		Mortality rate (%) 1%	2%	3%	4%	5%	10%	25%	50%	75%	100%
Displacement rate (%)	10%	0.31%	0.32%	0.33%	0.34%	0.35%	0.41%	0.58%	0.87%	1.16%	1.45%
	20%	0.32%	0.34%	0.36%	0.39%	0.41%	0.53%	0.87%	1.45%	2.02%	2.60%
	30%	0.33%	0.36%	0.40%	0.43%	0.47%	0.64%	1.16%	2.02%	2.89%	3.75%
	40%	0.34%	0.39%	0.43%	0.48%	0.53%	0.76%	1.45%	2.60%	3.75%	4.91%
	50%	0.35%	0.41%	0.47%	0.53%	0.58%	0.87%	1.74%	3.18%	4.62%	6.06%
	60%	0.36%	0.43%	0.50%	0.57%	0.64%	0.99%	2.02%	3.75%	5.48%	7.21%
	70%	0.38%	0.46%	0.54%	0.62%	0.70%	1.10%	2.31%	4.33%	6.35%	8.36%
	80%	0.39%	0.48%	0.57%	0.66%	0.76%	1.22%	2.60%	4.91%	7.21%	9.52%
	90%	0.40%	0.50%	0.61%	0.71%	0.81%	1.33%	2.89%	5.48%	8.07%	10.67%
	100%	0.41%	0.53%	0.64%	0.76%	0.87%	1.45%	3.18%	6.06%	8.94%	11.82%

Razorbill

Cape Wrath SPA

1.4.3.81 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Cape Wrath SPA, an in-combination assessment is presented within Table 1.102 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality).

Table 1.102: In-combination assessment for razorbill from the Cape Wrath SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	No connectivity	34	79	0.0129	No connectivity	0.0129	0.0093	0.01 to 0.16	-	0.00 to 0.03	0.00 to 0.05	0.01 to 0.24	0.03	-	0.01	0.01	0.05
Burbo Bank Extension	0	No connectivity	0	15	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.01	0.00 to 0.01	0.00	-	0.00	0.00	0.00
Erebus Floating Wind Demo	468	No connectivity	892	561	0.0129	No connectivity	0.0129	0.0093	0.02 to 0.42	-	0.03 to 0.81	0.02 to 0.37	0.07 to 1.59	0.08	-	0.16	0.07	0.32
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	134	No connectivity	986	259	0.0129	No connectivity	0.0129	0.0093	0.01 to 0.12	-	0.04 to 0.89	0.01 to 0.17	0.05 to 1.18	0.02	-	0.18	0.03	0.24
TwinHub (Wave Hub Floating Wind Farm)	0	No connectivity	0	28	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.02	0.00 to 0.02	0.00	-	0.00	0.00	0.00
Walney (3 & 4) Extension Offshore Wind Farm	0	No connectivity	456	1609	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.02 to 0.41	0.04 to 1.05	0.06 to 1.46	0.00	-	0.08	0.21	0.29
West of Duddon Sands Offshore Wind Farm	0	No connectivity	0	106	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.07	0.00 to 0.07	0.00	-	0.00	0.01	0.01
West of Orkney Windfarm	51	18	75	8	0.0129	0.255	0.0129	0.0093	0.00 to 0.05	0.05 to 1.25	0.00 to 0.07	0.00 to 0.01	0.06 to 1.37	0.01	0.25	0.01	0.00	0.27

Project	Un-apportioned abundances (adult birds) [a]				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
White Cross Offshore Windfarm	180	No connectivity	21	189	0.0129	No connectivity	0.0129	0.0093	0.01 to 0.16	-	0.00 to 0.02	0.01 to 0.12	0.01 to 0.30	0.03	-	0.00	0.02	0.06
Morecambe Offshore Windfarm Generation Assets	199	No connectivity	362	342	0.0129	No connectivity	0.0129	0.0093	0.01 to 0.18	-	0.01 to 0.33	0.01 to 0.22	0.03 to 0.73	0.04	-	0.07	0.04	0.15
Morgan Offshore Wind Project Generation Assets	171	No connectivity	133	614	0.0129	No connectivity	0.0129	0.0093	0.01 to 0.15	-	0.01 to 0.12	0.02 to 0.40	0.03 to 0.67	0.03	-	0.02	0.08	0.13
Mona Offshore Wind Project	1005	No connectivity	48	221	0.0129	No connectivity	0.0129	0.0093	0.04 to 0.91	-	0.00 to 0.04	0.01 to 0.14	0.05 to 1.09	0.18	-	0.01	0.03	0.22
Gap-filled projects																		
Barrow Offshore Wind Farm	2	No connectivity	1	1	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.18	-	0.01	0.03	0.22
Burbo Bank	5	No connectivity	3	5	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	-	0.00	0.00	0.00
Gwynt Y Môr Offshore Wind Farm	20	No connectivity	11	17	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.04	0.00	-	0.00	0.00	0.00
North Hoyle Offshore Wind Farm	6	No connectivity	3	5	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.01	-	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	-	0.00	0.00	0.01
Ormonde Offshore Wind Farm	5	No connectivity	3	4	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	-	0.00	0.00	0.00
Robin Rigg Offshore Wind Farm	8	No connectivity	6	7	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.00	0.00 to 0.02	0.00	-	0.00	0.00	0.00
Rhyl Flats Offshore Wind Farm	6	No connectivity	4	5	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.01	-	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	-	0.00	0.00	0.00
Walney 1 Offshore Wind Farm and 2	21	No connectivity	13	18	0.0129	No connectivity	0.0129	0.0093	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.04	0.00	-	0.00	0.00	0.00
Total predicted impact (adult birds)									**0.10 to 2.22**	**0.05 to 1.25**	**0.12 to 2.76**	**0.11 to 2.66**	**0.38 to 8.89**	**0.44**	**0.25**	**0.55**	**0.53**	**1.78**
Increase in baseline mortality (%)									**0.02% to 0.51%**	**0.01% to 0.28%**	**0.03% to 0.63%**	**0.03% to 0.61%**	**0.09% to 2.02%**	**0.10%**	**0.06%**	**0.13%**	**0.12%**	**0.40%**

1.4.3.82 As the predicted impact on razorbill from Cape Wrath SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality) the impact is further investigated by a PVA (see section1.5.6) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.83 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Cape Wrath SPA, one (Table 1.103) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.104) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement rates and 1-10% mortality rates), the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.47 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.6).

Table 1.103: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Cape Wrath SPA.

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	0	0	0	1	1	1	1
5%	0	0	0	0	0	1	1	2	3	3	5	6
10%	0	0	0	1	1	1	3	4	5	6	10	13
20%	0	1	1	1	1	3	5	8	10	13	19	25
30%	0	1	1	2	2	4	8	11	15	19	29	38
40%	1	1	2	2	3	5	10	15	20	25	38	51
50%	1	1	2	3	3	6	13	19	25	32	48	63
60%	1	2	2	3	4	8	15	23	30	38	57	76
70%	1	2	3	4	4	9	18	27	36	44	67	89
80%	1	2	3	4	5	10	20	30	41	51	76	102
90%	1	2	3	5	6	11	23	34	46	57	86	114
100%	1	3	4	5	6	13	25	38	51	63	95	127

Table 1.104: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Cape Wrath SPA(red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.01%	0.01%	0.01%	0.01%	0.03%	0.06%	0.09%	0.12%	0.14%	0.22%	0.29%
5%	0.01%	0.03%	0.04%	0.06%	0.07%	0.14%	0.29%	0.43%	0.58%	0.72%	1.08%	1.45%
10%	0.03%	0.06%	0.09%	0.12%	0.14%	0.29%	0.58%	0.87%	1.16%	1.45%	2.17%	2.89%
20%	0.06%	0.12%	0.17%	0.23%	0.29%	0.58%	1.16%	1.74%	2.31%	2.89%	4.34%	5.78%
30%	0.09%	0.17%	0.26%	0.35%	0.43%	0.87%	1.74%	2.60%	3.47%	4.34%	6.51%	8.68%
40%	0.12%	0.23%	0.35%	0.46%	0.58%	1.16%	2.31%	3.47%	4.63%	5.78%	8.68%	11.57%
50%	0.14%	0.29%	0.43%	0.58%	0.72%	1.45%	2.89%	4.34%	5.78%	7.23%	10.85%	14.46%
60%	0.17%	0.35%	0.52%	0.69%	0.87%	1.74%	3.47%	5.21%	6.94%	8.68%	13.01%	17.35%
70%	0.20%	0.40%	0.61%	0.81%	1.01%	2.02%	4.05%	6.07%	8.10%	10.12%	15.18%	20.24%
80%	0.23%	0.46%	0.69%	0.93%	1.16%	2.31%	4.63%	6.94%	9.25%	11.57%	17.35%	23.14%
90%	0.26%	0.52%	0.78%	1.04%	1.30%	2.60%	5.21%	7.81%	10.41%	13.01%	19.52%	26.03%
100%	0.29%	0.58%	0.87%	1.16%	1.45%	2.89%	5.78%	8.68%	11.57%	14.46%	21.69%	28.92%

Handa SPA

1.4.3.85 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Handa SPA, an in-combination assessment is presented within Table 1.105 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality).

Table 1.105: In-combination assessment for razorbill from the Handa SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	No connectivity	34	79	0.0319	No connectivity	0.0319	0.0231	0.02 to 0.39	-	0.00 to 0.08	0.01 to 0.13	0.03 to 0.60	0.08	-	0.02	0.03	0.12
Burbo Bank Extension	0	No connectivity	0	15	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.02	0.00 to 0.02	0.00	-	0.00	0.00	0.00
Erebus Floating Wind Demo	468	No connectivity	892	561	0.0319	No connectivity	0.0319	0.0231	0.04 to 1.04	-	0.09 to 1.99	0.04 to 0.91	0.17 to 3.94	0.21	-	0.40	0.18	0.79
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	134	No connectivity	986	259	0.0319	No connectivity	0.0319	0.0231	0.01 to 0.30	-	0.09 to 2.20	0.02 to 0.42	0.13 to 2.92	0.06	-	0.44	0.08	0.58
TwinHub (Wave Hub Floating Wind Farm)	0	No connectivity	0	28	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.04	0.00 to 0.04	0.00	-	0.00	0.01	0.01
Walney (3 & 4) Extension Offshore Wind Farm	0	No connectivity	456	1609	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.00	-	0.04 to 1.02	0.11 to 2.60	0.16 to 3.62	0.00	-	0.20	0.52	0.72
West of Duddon Sands Offshore Wind Farm	0	No connectivity	0	106	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.00	-	0.00 to 0.00	0.01 to 0.17	0.01 to 0.17	0.00	-	0.00	0.03	0.03
West of Orkney Windfarm	51	18	75	8	0.0319	0.1398	0.0319	0.0231	0.00 to 0.11	0.03 to 0.69	0.01 to 0.17	0.00 to 0.01	0.04 to 0.98	0.02	0.14	0.03	0.00	0.20
White Cross Offshore Windfarm	180	No connectivity	21	189	0.0319	No connectivity	0.0319	0.0231	0.02 to 0.40	-	0.00 to 0.05	0.01 to 0.31	0.03 to 0.76	0.08	-	0.01	0.06	0.15
Morecambe Offshore Windfarm Generation Assets	199	No connectivity	362	342	0.0319	No connectivity	0.0319	0.0231	0.02 to 0.45	-	0.03 to 0.81	0.02 to 0.55	0.08 to 1.81	0.09	-	0.16	0.11	0.36
Morgan Offshore Wind Project Generation Assets	171	No connectivity	133	614	0.0319	No connectivity	0.0319	0.0231	0.02 to 0.38	-	0.01 to 0.30	0.04 to 0.99	0.07 to 1.67	0.08	-	0.06	0.20	0.33
Mona Offshore Wind Project	1005	No connectivity	48	221	0.0319	No connectivity	0.0319	0.0231	0.10 to 2.24	-	0.00 to 0.11	0.02 to 0.36	0.12 to 2.71	0.45	-	0.02	0.07	0.54
Gap-filled projects																		
Barrow Offshore Wind Farm	2	No connectivity	1	1	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	-	0.00	0.00	0.00
Burbo Bank	5	No connectivity	3	5	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Gwynt Y Môr Offshore Wind Farm	20	No connectivity	11	17	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.05	-	0.00 to 0.03	0.00 to 0.03	0.00 to 0.10	0.01	-	0.01	0.01	0.02
North Hoyle Offshore Wind Farm	6	No connectivity	3	5	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Ormonde Offshore Wind Farm	5	No connectivity	3	4	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Robin Rigg Offshore Wind Farm	8	No connectivity	6	7	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.04	0.00	-	0.00	0.00	0.01

Project	Un-apportioned abundances (adult birds) [a]				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
Rhyl Flats Offshore Wind Farm	6	No connectivity	4	5	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Walney 1 Offshore Wind Farm and 2	21	No connectivity	13	18	0.0319	No connectivity	0.0319	0.0231	0.00 to 0.05	-	0.00 to 0.03	0.00 to 0.03	0.00 to 0.10	0.01	-	0.01	0.01	0.02
Total predicted impact (adult birds)									**0.24 to 5.49**	**0.03 to 0.69**	**0.29 to 6.81**	**0.28 to 6.62**	**0.84 to 19.60**	**1.10**	**0.14**	**1.36**	**1.32**	**3.92**
Increase in baseline mortality (%)									**0.02% to 0.51%**	**0.00% to 0.06%**	**0.03% to 0.63%**	**0.03% to 0.61%**	**0.08% to 1.81%**	**0.10%**	**0.01%**	**0.13%**	**0.12%**	**0.36%**

1.4.3.86 As the predicted impact on razorbill from Handa SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality) the impact is further investigated by a PVA (see section 1.5.6 to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.87 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Handa SPA, one (Table 1.106) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.107) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement rates and 1-10% mortality rates), the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.107 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.6).

Table 1.106: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Handa SPA.

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	0	1	1	1	1	2	3
5%	0	0	0	1	1	1	3	4	6	7	11	14
10%	0	1	1	1	1	3	6	8	11	14	21	28
20%	1	1	2	2	3	6	11	17	22	28	42	56
30%	1	2	3	3	4	8	17	25	34	42	63	84
40%	1	2	3	4	6	11	22	34	45	56	84	112
50%	1	3	4	6	7	14	28	42	56	70	105	140
60%	2	3	5	7	8	17	34	50	67	84	126	168
70%	2	4	6	8	10	20	39	59	78	98	147	196
80%	2	4	7	9	11	22	45	67	90	112	168	224
90%	3	5	8	10	13	25	50	76	101	126	189	252
100%	3	6	8	11	14	28	56	84	112	140	210	280

Table 1.107: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Handa SPA (red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.01%	0.01%	0.01%	0.01%	0.03%	0.05%	0.08%	0.10%	0.13%	0.19%	0.26%
5%	0.01%	0.03%	0.04%	0.05%	0.06%	0.13%	0.26%	0.39%	0.52%	0.65%	0.97%	1.29%
10%	0.03%	0.05%	0.08%	0.10%	0.13%	0.26%	0.52%	0.77%	1.03%	1.29%	1.94%	2.58%
20%	0.05%	0.10%	0.15%	0.21%	0.26%	0.52%	1.03%	1.55%	2.07%	2.58%	3.87%	5.16%
30%	0.08%	0.15%	0.23%	0.31%	0.39%	0.77%	1.55%	2.32%	3.10%	3.87%	5.81%	7.75%
40%	0.10%	0.21%	0.31%	0.41%	0.52%	1.03%	2.07%	3.10%	4.13%	5.16%	7.75%	10.33%
50%	0.13%	0.26%	0.39%	0.52%	0.65%	1.29%	2.58%	3.87%	5.16%	6.45%	9.68%	12.91%
60%	0.15%	0.31%	0.46%	0.62%	0.77%	1.55%	3.10%	4.65%	6.20%	7.75%	11.62%	15.49%
70%	0.18%	0.36%	0.54%	0.72%	0.90%	1.81%	3.61%	5.42%	7.23%	9.04%	13.56%	18.07%
80%	0.21%	0.41%	0.62%	0.83%	1.03%	2.07%	4.13%	6.20%	8.26%	10.33%	15.49%	20.66%
90%	0.23%	0.46%	0.70%	0.93%	1.16%	2.32%	4.65%	6.97%	9.29%	11.62%	17.43%	23.24%
100%	0.26%	0.52%	0.77%	1.03%	1.29%	2.58%	5.16%	7.75%	10.33%	12.91%	19.36%	25.82%

Shiant Isles SPA

1.4.3.88 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Shiant Isles SPA, an in-combination assessment is presented within Table 1.108 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality). As there is no connectivity for any sites during the breeding season, no 'breeding season' column has been included within the table.

Table 1.108: In-combination assessment for razorbill from the Shiant Isles SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)				Apportioned displacement impact values (70% displacement, 2% mortality)			
	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	34	79	0.0263	0.0263	0.019	0.01 to 0.32	0.00 to 0.06	0.00 to 0.10	0.02 to 0.49	0.06	0.01	0.02	0.10
Burbo Bank Extension	0	0	15	0.0263	0.0263	0.019	0.00 to 0.00	0.00 to 0.00	0.00 to 0.02	0.00 to 0.02	0.00	0.00	0.00	0.00
Erebus Floating Wind Demo	468	892	561	0.0263	0.0263	0.019	0.04 to 0.86	0.07 to 1.64	0.05 to 0.75	0.16 to 3.25	0.17	0.33	0.15	0.65
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	134	986	259	0.0263	0.0263	0.019	0.01 to 0.25	0.08 to 1.82	0.06 to 0.34	0.14 to 2.41	0.05	0.36	0.07	0.48
TwinHub (Wave Hub Floating Wind Farm)	0	0	28	0.0263	0.0263	0.019	0.00 to 0.00	0.00 to 0.00	0.00 to 0.04	0.00 to 0.04	0.00	0.00	0.01	0.01
Walney (3 and 4) Extension Offshore Wind Farm	0	456	1609	0.0263	0.0263	0.019	0.00 to 0.00	0.04 to 0.84	0.03 to 2.14	0.06 to 2.98	0.00	0.17	0.43	0.60
West of Duddon Sands Offshore Wind Farm	0	0	106	0.0263	0.0263	0.019	0.00 to 0.00	0.00 to 0.00	0.00 to 0.14	0.00 to 0.14	0.00	0.00	0.03	0.03
West of Orkney Windfarm	51	75	8	0.0263	0.0263	0.019	0.00 to 0.09	0.01 to 0.14	0.00 to 0.01	0.01 to 0.24	0.02	0.03	0.00	0.05

Project	Un-apportioned abundances (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)				Apportioned displacement impact values (70% displacement, 2% mortality)			
	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Post-breeding	Non-breeding	Annual
White Cross Offshore Windfarm	180	21	189	0.0263	0.0263	0.019	0.01 to 0.33	0.00 to 0.04	0.00 to 0.25	0.02 to 0.62	0.07	0.01	0.05	0.12
Morecambe Offshore Windfarm Generation Assets	199	362	342	0.0263	0.0263	0.019	0.02 to 0.37	0.03 to 0.67	0.02 to 0.45	0.07 to 1.49	0.07	0.13	0.09	0.30
Morgan Offshore Wind Project Generation Assets	171	133	614	0.0263	0.0263	0.019	0.01 to 0.32	0.01 to 0.24	0.01 to 0.82	0.03 to 1.38	0.06	0.05	0.16	0.28
Mona Offshore Wind Project	1,005	48	221	0.0263	0.0263	0.019	0.08 to 1.85	0.00 to 0.09	0.00 to 0.29	0.09 to 2.23	0.37	0.02	0.06	0.45
Gap-filled projects														
Barrow Offshore Wind Farm	2	1	1	0.0263	0.0263	0.019	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Burbo Bank	5	3	5	0.0263	0.0263	0.019	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.00	0.00	0.00
Gwynt Y Môr Offshore Wind Farm	20	11	17	0.0263	0.0263	0.019	0.00 to 0.04	0.00 to 0.02	0.00 to 0.02	0.00 to 0.08	0.01	0.00	0.00	0.02
North Hoyle Offshore Wind Farm	6	3	5	0.0263	0.0263	0.019	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.00	0.00	0.00
Ormonde Offshore Wind Farm	5	3	4	0.0263	0.0263	0.019	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.00	0.00	0.00
Robin Rigg Offshore Wind Farm	8	6	7	0.0263	0.0263	0.019	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	0.00	0.00	0.01
Rhyl Flats Offshore Wind Farm	6	4	5	0.0263	0.0263	0.019	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	0.00	0.00	0.01
Walney 1 Offshore Wind Farm and 2	21	13	18	0.0263	0.0263	0.019	0.00 to 0.04	0.00 to 0.02	0.00 to 0.02	0.00 to 0.09	0.01	0.00	0.00	0.02
Total predicted impact (adult birds)							**0.19 to 4.52**	**0.24 to 5.62**	**0.17 to 5.44**	**0.60 to 15.58**	**0.90**	**1.12**	**1.09**	**3.12**
Increase in baseline mortality (%)							**0.02% to 0.51%**	**0.03% to 0.63%**	**0.02% to 0.61%**	**0.07% to 1.75%**	**0.10%**	**0.13%**	**0.12%**	**0.35%**

1.4.3.89 As the predicted impact on razorbill from Shiant Isles SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality) the impact is further investigated by a PVA (see section 1.5.6) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.90 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Shiant Isles SPA, one (Table 1.109) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.110) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement rates and 1-10% mortality rates) and the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.110 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.6).

Table 1.109: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Shiant Isles SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	0	0	1	1	1	2	2
5%	0	0	0	0	1	1	2	3	4	6	8	11
10%	0	0	1	1	1	2	4	7	9	11	17	22
20%	0	1	1	2	2	4	9	13	18	22	33	45
30%	1	1	2	3	3	7	13	20	27	33	50	67
40%	1	2	3	4	4	9	18	27	36	45	67	89
50%	1	2	3	4	6	11	22	33	45	56	83	111
60%	1	3	4	5	7	13	27	40	53	67	100	134
70%	2	3	5	6	8	16	31	47	62	78	117	156
80%	2	4	5	7	9	18	36	53	71	89	134	178
90%	2	4	6	8	10	20	40	60	80	100	150	200
100%	2	4	7	9	11	22	45	67	89	111	167	223

Table 1.110: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Shiant Isles SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.05%	0.07%	0.10%	0.12%	0.19%	0.25%
5%	0.01%	0.02%	0.04%	0.05%	0.06%	0.12%	0.25%	0.37%	0.50%	0.62%	0.94%	1.25%
10%	0.02%	0.05%	0.07%	0.10%	0.12%	0.25%	0.50%	0.75%	1.00%	1.25%	1.87%	2.50%
20%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.00%	1.50%	2.00%	2.50%	3.74%	4.99%
30%	0.07%	0.15%	0.22%	0.30%	0.37%	0.75%	1.50%	2.25%	2.99%	3.74%	5.62%	7.49%
40%	0.10%	0.20%	0.30%	0.40%	0.50%	1.00%	2.00%	2.99%	3.99%	4.99%	7.49%	9.98%
50%	0.12%	0.25%	0.37%	0.50%	0.62%	1.25%	2.50%	3.74%	4.99%	6.24%	9.36%	12.48%
60%	0.15%	0.30%	0.45%	0.60%	0.75%	1.50%	2.99%	4.49%	5.99%	7.49%	11.23%	14.97%
70%	0.17%	0.35%	0.52%	0.70%	0.87%	1.75%	3.49%	5.24%	6.99%	8.73%	13.10%	17.47%
80%	0.20%	0.40%	0.60%	0.80%	1.00%	2.00%	3.99%	5.99%	7.99%	9.98%	14.97%	19.97%
90%	0.22%	0.45%	0.67%	0.90%	1.12%	2.25%	4.49%	6.74%	8.98%	11.23%	16.85%	22.46%
100%	0.25%	0.50%	0.75%	1.00%	1.25%	2.50%	4.99%	7.49%	9.98%	12.48%	18.72%	24.96%

Flannan Isles SPA

1.4.3.91 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Flanna Isles SPA, an in-combination assessment is presented within Table 1.111 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality). As there is no connectivity for any sites during the breeding season, no 'breeding season' column has been included within the table.

Table 1.111: In-combination assessment for razorbill from the Flannan Isles SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)				Apportioned displacement impact values (70% displacement, 2% mortality)			
	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	34	79	0.0065	0.0065	0.0047	0.00 to 0.08	0.00 to 0.02	0.00 to 0.03	0.01 to 0.12	0.02	0.00	0.01	0.02
Burbo Bank Extension	0	0	15	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00 to 0.01	0.00	0.00	0.00	0.00
Erebus Floating Wind Demo	468	892	561	0.0065	0.0065	0.0047	0.01 to 0.21	0.02 to 0.41	0.01 to 0.18	0.03 to 0.80	0.04	0.08	0.04	0.16
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	134	986	259	0.0065	0.0065	0.0047	0.00 to 0.06	0.02 to 0.45	0.00 to 0.09	0.03 to 0.59	0.01	0.09	0.02	0.12
TwinHub (Wave Hub Floating Wind Farm)	0	0	28	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00 to 0.01	0.00	0.00	0.00	0.00
Walney (3 and 4) Extension Offshore Wind Farm	0	456	1609	0.0065	0.0065	0.0047	0.00 to 0.00	0.01 to 0.21	0.02 to 0.53	0.03 to 0.74	0.00	0.04	0.11	0.15
West of Duddon Sands Offshore Wind Farm	0	0	106	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.03	0.00 to 0.03	0.00	0.00	0.01	0.01
West of Orkney Windfarm	51	75	8	0.0065	0.0065	0.0047	0.00 to 0.02	0.00 to 0.03	0.00 to 0.00	0.00 to 0.06	0.00	0.01	0.00	0.01
White Cross Offshore Windfarm	180	21	189	0.0065	0.0065	0.0047	0.00 to 0.08	0.00 to 0.01	0.00 to 0.06	0.01 to 0.15	0.02	0.00	0.01	0.03
Morecambe Offshore Windfarm Generation Assets	199	362	342	0.0065	0.0065	0.0047	0.00 to 0.09	0.01 to 0.16	0.00 to 0.11	0.02 to 0.37	0.02	0.03	0.02	0.07
Morgan Offshore Wind Project Generation Assets	171	133	614	0.0065	0.0065	0.0047	0.00 to 0.08	0.00 to 0.06	0.01 to 0.20	0.01 to 0.34	0.02	0.01	0.04	0.07
Mona Offshore Wind Project	1,005	48	221	0.0065	0.0065	0.0047	0.02 to 0.46	0.00 to 0.02	0.00 to 0.07	0.02 to 0.55	0.09	0.00	0.01	0.11
Gap-filled projects														
Barrow Offshore Wind Farm	2	1	1	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00	0.00	0.00	0.00
Burbo Bank	5	3	5	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Gwynt Y Môr Offshore Wind Farm	20	11	17	0.0065	0.0065	0.0047	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.00	0.00	0.00
North Hoyle Offshore Wind Farm	6	3	5	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Ormonde Offshore Wind Farm	5	3	4	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Robin Rigg Offshore Wind Farm	8	6	7	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Rhyl Flats Offshore Wind Farm	6	4	5	0.0065	0.0065	0.0047	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Walney 1 Offshore Wind Farm and 2	21	13	18	0.0065	0.0065	0.0047	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.00	0.00	0.00
Total predicted impact (adult birds)							**0.05 to 1.12**	**0.06 to 1.39**	**0.06 to 1.35**	**0.17 to 3.85**	**0.22**	**0.28**	**0.27**	**0.77**
Increase in baseline mortality (%)							**0.02% to 0.51%**	**0.03% to 0.63%**	**0.03% to 0.61%**	**0.07% to 1.75%**	**0.10%**	**0.13%**	**0.12%**	**0.35%**

1.4.3.92 As the predicted impact on razorbill from Flannan Isles SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality), the impact is further investigated by a PVA (see section 1.5.6) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.93 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Flannan Isles SPA, one (Table 1.112) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.113) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement rates and 1-

10% mortality rates), the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.113 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.61.5.6).

Table 1.112: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Flannan Isles SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	0	0	0	0	0	0	1
5%	0	0	0	0	0	0	1	1	1	1	2	3
10%	0	0	0	0	0	1	1	2	2	3	4	6
20%	0	0	0	0	1	1	2	3	4	6	8	11
30%	0	0	0	1	1	2	3	5	7	8	12	17
40%	0	0	1	1	1	2	4	7	9	11	17	22
50%	0	1	1	1	1	3	6	8	11	14	21	28
60%	0	1	1	1	2	3	7	10	13	17	25	33
70%	0	1	1	2	2	4	8	12	15	19	29	39
80%	0	1	1	2	2	4	9	13	18	22	33	44
90%	0	1	1	2	2	5	10	15	20	25	37	50
100%	1	1	2	2	3	6	11	17	22	28	41	55

Table 1.113: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Flannan Isles SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.05%	0.07%	0.10%	0.12%	0.19%	0.25%
5%	0.01%	0.02%	0.04%	0.05%	0.06%	0.12%	0.25%	0.37%	0.50%	0.62%	0.94%	1.25%
10%	0.02%	0.05%	0.07%	0.10%	0.12%	0.25%	0.50%	0.75%	1.00%	1.25%	1.87%	2.49%
20%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.00%	1.50%	2.00%	2.49%	3.74%	4.99%
30%	0.07%	0.15%	0.22%	0.30%	0.37%	0.75%	1.50%	2.24%	2.99%	3.74%	5.61%	7.48%
40%	0.10%	0.20%	0.30%	0.40%	0.50%	1.00%	2.00%	2.99%	3.99%	4.99%	7.48%	9.98%
50%	0.12%	0.25%	0.37%	0.50%	0.62%	1.25%	2.49%	3.74%	4.99%	6.23%	9.35%	12.47%
60%	0.15%	0.30%	0.45%	0.60%	0.75%	1.50%	2.99%	4.49%	5.99%	7.48%	11.22%	14.96%
70%	0.17%	0.35%	0.52%	0.70%	0.87%	1.75%	3.49%	5.24%	6.98%	8.73%	13.09%	17.46%
80%	0.20%	0.40%	0.60%	0.80%	1.00%	2.00%	3.99%	5.99%	7.98%	9.98%	14.96%	19.95%
90%	0.22%	0.45%	0.67%	0.90%	1.12%	2.24%	4.49%	6.73%	8.98%	11.22%	16.83%	22.44%
100%	0.25%	0.50%	0.75%	1.00%	1.25%	2.49%	4.99%	7.48%	9.98%	12.47%	18.70%	24.94%

Mingulay and Berneray SPA

1.4.3.94 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Mingulay and Berneray SPA, an in-combination assessment is presented within Table 1.114 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality). As there is no connectivity for any sites during the breeding season, no 'breeding season' column has been included within the table.

Table 1.114: In-combination assessment for razorbill from the Mingulay and Berneray SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)				Apportioned displacement impact values (70% displacement, 2% mortality)			
	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	34	79	0.0625	0.0625	0.0451	0.03 to 0.77	0.01 to 0.15	0.01 to 0.25	0.05 to 1.17	0.15	0.03	0.05	0.23
Burbo Bank Extension	0	0	15	0.0625	0.0625	0.0451	0.00 to 0.00	0.00 to 0.00	0.00 to 0.05	0.00 to 0.05	0.00	0.00	0.01	0.01
Erebus Floating Wind Demo	468	892	561	0.0625	0.0625	0.0451	0.09 to 2.05	0.17 to 3.90	0.08 to 1.77	0.33 to 7.72	0.41	0.78	0.35	1.54
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	134	986	259	0.0625	0.0625	0.0451	0.03 to 0.59	0.18 to 4.31	0.04 to 0.82	0.25 to 5.72	0.12	0.86	0.16	1.14
TwinHub (Wave Hub Floating Wind Farm)	0	0	28	0.0625	0.0625	0.0451	0.00 to 0.00	0.00 to 0.00	0.00 to 0.09	0.00 to 0.09	0.00	0.00	0.02	0.02
Walney (3 and 4) Extension Offshore Wind Farm	0	456	1609	0.0625	0.0625	0.0451	0.00 to 0.00	0.09 to 2.00	0.22 to 5.08	0.30 to 7.08	0.00	0.40	1.02	1.42
West of Duddon Sands Offshore Wind Farm	0	0	106	0.0625	0.0625	0.0451	0.00 to 0.00	0.00 to 0.00	0.01 to 0.33	0.01 to 0.33	0.00	0.00	0.07	0.07
West of Orkney Windfarm	51	75	8	0.0625	0.0625	0.0451	0.01 to 0.22	0.01 to 0.33	0.00 to 0.02	0.02 to 0.58	0.04	0.07	0.00	0.12
White Cross Offshore Windfarm	180	21	189	0.0625	0.0625	0.0451	0.03 to 0.79	0.00 to 0.09	0.03 to 0.60	0.06 to 1.48	0.16	0.02	0.12	0.30
Morecambe Offshore Windfarm Generation Assets	199	362	342	0.0625	0.0625	0.0451	0.04 to 0.87	0.07 to 1.59	0.05 to 1.08	0.15 to 3.54	0.17	0.32	0.22	0.71
Morgan Offshore Wind Project Generation Assets	171	133	614	0.0625	0.0625	0.0451	0.03 to 0.75	0.02 to 0.58	0.08 to 1.94	0.14 to 3.27	0.15	0.12	0.39	0.65
Mona Offshore Wind Project	1,005	48	221	0.0625	0.0625	0.0451	0.19 to 4.40	0.01 to 0.21	0.03 to 0.70	0.23 to 5.30	0.88	0.04	0.14	1.06
Gap-filled projects														
Barrow Offshore Wind Farm	2	1	1	0.0625	0.0625	0.0451	0.00 to 0.01	0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00	0.00	0.00	0.00
Burbo Bank	5	3	5	0.0625	0.0625	0.0451	0.00 to 0.02	0.00 to 0.01	0.00 to 0.01	0.00 to 0.05	0.00	0.00	0.00	0.01
Gwynt Y Môr Offshore Wind Farm	20	11	17	0.0625	0.0625	0.0451	0.00 to 0.09	0.00 to 0.05	0.00 to 0.05	0.01 to 0.19	0.02	0.01	0.01	0.04
North Hoyle Offshore Wind Farm	6	3	5	0.0625	0.0625	0.0451	0.00 to 0.03	0.00 to 0.01	0.00 to 0.01	0.00 to 0.05	0.01	0.00	0.00	0.01
Ormonde Offshore Wind Farm	5	3	4	0.0625	0.0625	0.0451	0.00 to 0.02	0.00 to 0.01	0.00 to 0.01	0.00 to 0.05	0.00	0.00	0.00	0.01
Robin Rigg Offshore Wind Farm	8	6	7	0.0625	0.0625	0.0451	0.00 to 0.03	0.00 to 0.03	0.00 to 0.02	0.00 to 0.08	0.01	0.01	0.00	0.02
Rhyl Flats Offshore Wind Farm	6	4	5	0.0625	0.0625	0.0451	0.00 to 0.03	0.00 to 0.02	0.00 to 0.02	0.00 to 0.06	0.01	0.00	0.00	0.01
Walney 1 Offshore Wind Farm and 2	21	13	18	0.0625	0.0625	0.0451	0.00 to 0.09	0.00 to 0.06	0.00 to 0.06	0.01 to 0.20	0.02	0.01	0.01	0.04
Total predicted impact (adult birds)							**0.46 to 10.75**	**0.57 to 13.35**	**0.55 to 12.92**	**1.59 to 37.02**	**2.15**	**2.67**	**2.58**	**7.40**
Increase in baseline mortality (%)							**0.02% to 0.51%**	**0.03% to 0.63%**	**0.03% to 0.61%**	**0.07% to 1.74%**	**0.10%**	**0.13%**	**0.12%**	**0.35%**

1.4.3.95 As the predicted impact on razorbill from Mingulay and Berneray SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality), the impact is further investigated by a PVA (see section 1.5.6) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.96 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Mingulay and Berneray SPA, one (Table 1.115) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.116) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement

rates and 1-10% mortality rates) and the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.116 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.6).

Table 1.115: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Mingulay and Berneray SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	1	1	2	2	3	4	5
5%	0	1	1	1	1	3	5	8	11	13	20	26
10%	1	1	2	2	3	5	11	16	21	26	40	53
20%	1	2	3	4	5	11	21	32	42	53	79	106
30%	2	3	5	6	8	16	32	48	63	79	119	159
40%	2	4	6	8	11	21	42	63	85	106	159	212
50%	3	5	8	11	13	26	53	79	106	132	198	264
60%	3	6	10	13	16	32	63	95	127	159	238	317
70%	4	7	11	15	19	37	74	111	148	185	278	370
80%	4	8	13	17	21	42	85	127	169	212	317	423
90%	5	10	14	19	24	48	95	143	190	238	357	476
100%	5	11	16	21	26	53	106	159	212	264	397	529

Table 1.116: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Mingulay and Berneray SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.05%	0.07%	0.10%	0.12%	0.19%	0.25%
5%	0.01%	0.02%	0.04%	0.05%	0.06%	0.12%	0.25%	0.37%	0.50%	0.62%	0.93%	1.25%
10%	0.02%	0.05%	0.07%	0.10%	0.12%	0.25%	0.50%	0.75%	1.00%	1.25%	1.87%	2.49%
20%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.00%	1.49%	1.99%	2.49%	3.74%	4.98%
30%	0.07%	0.15%	0.22%	0.30%	0.37%	0.75%	1.49%	2.24%	2.99%	3.74%	5.60%	7.47%
40%	0.10%	0.20%	0.30%	0.40%	0.50%	1.00%	1.99%	2.99%	3.99%	4.98%	7.47%	9.96%
50%	0.12%	0.25%	0.37%	0.50%	0.62%	1.25%	2.49%	3.74%	4.98%	6.23%	9.34%	12.45%
60%	0.15%	0.30%	0.45%	0.60%	0.75%	1.49%	2.99%	4.48%	5.98%	7.47%	11.21%	14.94%
70%	0.17%	0.35%	0.52%	0.70%	0.87%	1.74%	3.49%	5.23%	6.97%	8.72%	13.08%	17.44%
80%	0.20%	0.40%	0.60%	0.80%	1.00%	1.99%	3.99%	5.98%	7.97%	9.96%	14.94%	19.93%
90%	0.22%	0.45%	0.67%	0.90%	1.12%	2.24%	4.48%	6.72%	8.97%	11.21%	16.81%	22.42%
100%	0.25%	0.50%	0.75%	1.00%	1.25%	2.49%	4.98%	7.47%	9.96%	12.45%	18.68%	24.91%

Rathlin Island SPA

1.4.3.97 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Rathlin Island SPA, an in-combination assessment is presented within Table 1.117 (30-70% displacement and 1-10% mortality and 70% displacement and 2% mortality). As there is no connectivity for any sites during the breeding season, no 'breeding season' column has been included within the table.

Table 1.117: In-combination assessment for razorbill from the Rathlin Island SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

Project	Un-apportioned abundances (adult birds) [a]			Apportioning values			Apportioned displacement impact values (30-70% displacement and 1-10% mortality)				Apportioned displacement impact values (70% displacement, 2% mortality)			
	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Pre-breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	34	79	0.0952	0.0952	0.0687	0.05 to 1.17	0.01 to 0.23	0.02 to 0.38	0.08 to 1.78	0.23	0.05	0.08	0.36
Burbo Bank Extension	0	0	15	0.0952	0.0952	0.0687	0.00 to 0.00	0.00 to 0.00	0.00 to 0.07	0.00 to 0.07	0.00	0.00	0.01	0.01
Erebus Floating Wind Demo	468	892	561	0.0952	0.0952	0.0687	0.13 to 3.12	0.25 to 5.94	0.12 to 2.70	0.50 to 11.76	0.62	1.19	0.54	2.35
Llŷr 1 Floating Offshore Wind Farm Offshore Wind Project	134	986	259	0.0952	0.0952	0.0687	0.04 to 0.89	0.28 to 6.57	0.05 to 1.24	0.37 to 8.71	0.18	1.31	0.25	1.74
TwinHub (Wave Hub Floating Wind Farm)	0	0	28	0.0952	0.0952	0.0687	0.00 to 0.00	0.00 to 0.00	0.01 to 0.13	0.01 to 0.13	0.00	0.00	0.03	0.03
Walney (3 and 4) Extension Offshore Wind Farm	0	456	1609	0.0952	0.0952	0.0687	0.00 to 0.00	0.13 to 3.04	0.33 to 7.74	0.46 to 10.78	0.00	0.61	1.55	2.16
West of Duddon Sands Offshore Wind Farm	0	0	106	0.0952	0.0952	0.0687	0.00 to 0.00	0.00 to 0.00	0.02 to 0.51	0.02 to 0.51	0.00	0.00	0.10	0.10
West of Orkney Windfarm	51	75	8	0.0952	0.0952	0.0687	0.01 to 0.34	0.02 to 0.50	0.00 to 0.04	0.04 to 0.88	0.07	0.10	0.01	0.18
White Cross Offshore Windfarm	180	21	189	0.0952	0.0952	0.0687	0.05 to 1.20	0.01 to 0.14	0.04 to 0.91	0.10 to 2.25	0.24	0.03	0.18	0.45
Morecambe Offshore Windfarm Generation Assets	199	362	342	0.0952	0.0952	0.0687	0.06 to 1.33	0.10 to 2.42	0.07 to 1.64	0.23 to 5.39	0.27	0.48	0.33	1.08
Morgan Offshore Wind Project Generation Assets	171	133	614	0.0952	0.0952	0.0687	0.05 to 1.14	0.04 to 0.88	0.13 to 2.95	0.21 to 4.98	0.23	0.18	0.59	1.00
Mona Offshore Wind Project	1,005	48	221	0.0952	0.0952	0.0687	0.29 to 6.70	0.01 to 0.32	0.05 to 1.06	0.35 to 8.07	1.34	0.06	0.21	1.61
Gap-filled projects														
Barrow Offshore Wind Farm	2	1	1	0.0952	0.0952	0.0687	0.00 to 0.01	0.00 to 0.01	0.00 to 0.01	0.00 to 0.02	0.00	0.00	0.00	0.00
Burbo Bank	5	3	5	0.0952	0.0952	0.0687	0.00 to 0.03	0.00 to 0.02	0.00 to 0.02	0.00 to 0.08	0.01	0.00	0.00	0.02
Gwynt Y Môr Offshore Wind Farm	20	11	17	0.0952	0.0952	0.0687	0.01 to 0.14	0.00 to 0.08	0.00 to 0.08	0.01 to 0.29	0.03	0.02	0.02	0.06
North Hoyle Offshore Wind Farm	6	3	5	0.0952	0.0952	0.0687	0.00 to 0.04	0.00 to 0.02	0.00 to 0.02	0.00 to 0.08	0.01	0.00	0.00	0.02
Ormonde Offshore Wind Farm	5	3	4	0.0952	0.0952	0.0687	0.00 to 0.03	0.00 to 0.02	0.00 to 0.02	0.00 to 0.08	0.01	0.00	0.00	0.02
Robin Rigg Offshore Wind Farm	8	6	7	0.0952	0.0952	0.0687	0.00 to 0.05	0.00 to 0.04	0.00 to 0.04	0.01 to 0.13	0.01	0.01	0.01	0.03
Rhyl Flats Offshore Wind Farm	6	4	5	0.0952	0.0952	0.0687	0.00 to 0.04	0.00 to 0.02	0.00 to 0.03	0.00 to 0.09	0.01	0.00	0.01	0.02
Walney 1 Offshore Wind Farm and 2	21	13	18	0.0952	0.0952	0.0687	0.01 to 0.14	0.00 to 0.09	0.00 to 0.09	0.01 to 0.31	0.03	0.02	0.02	0.06
Total predicted impact (adult birds)							**0.70 to 16.37**	**0.87 to 20.34**	**0.84 to 19.68**	**2.42 to 56.39**	**3.27**	**4.07**	**3.94**	**11.28**
Increase in baseline mortality (%)							**0.02% to 0.51%**	**0.03% to 0.63%**	**0.03% to 0.61%**	**0.07% to 1.74%**	**0.10%**	**0.13%**	**0.12%**	**0.35%**

1.4.3.98 As the predicted impact on razorbill from Rathlin Island SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality) the impact is further investigated by a PVA (see section 1.5.6) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.99 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Rathlin Island SPA, one (Table 1.115) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.119) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement rates and 1-10% mortality rates) and the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage

2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.119 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.6).

Table 1.118: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Rathlin Island SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	1	0	0	0	0	1	2	2	3	4	6	8
5%	0	1	1	2	2	4	8	12	16	20	30	40
10%	1	2	2	3	4	8	16	24	32	40	60	81
20%	2	3	5	6	8	16	32	48	64	81	121	161
30%	2	5	7	10	12	24	48	73	97	121	181	242
40%	3	6	10	13	16	32	64	97	129	161	242	322
50%	4	8	12	16	20	40	81	121	161	201	302	403
60%	5	10	15	19	24	48	97	145	193	242	363	483
70%	6	11	17	23	28	56	113	169	226	282	423	564
80%	6	13	19	26	32	64	129	193	258	322	483	644
90%	7	15	22	29	36	73	145	218	290	363	544	725
100%	8	16	24	32	40	81	161	242	322	403	604	806

Table 1.119: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Rathlin Island SPA (red text indicates >1%).

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.05%	0.07%	0.10%	0.12%	0.19%	0.25%
5%	0.01%	0.02%	0.04%	0.05%	0.06%	0.12%	0.25%	0.37%	0.50%	0.62%	0.93%	1.25%
10%	0.02%	0.05%	0.07%	0.10%	0.12%	0.25%	0.50%	0.75%	1.00%	1.25%	1.87%	2.49%
20%	0.05%	0.10%	0.15%	0.20%	0.25%	0.50%	1.00%	1.50%	1.99%	2.49%	3.74%	4.98%
30%	0.07%	0.15%	0.22%	0.30%	0.37%	0.75%	1.50%	2.24%	2.99%	3.74%	5.61%	7.48%
40%	0.10%	0.20%	0.30%	0.40%	0.50%	1.00%	1.99%	2.99%	3.99%	4.98%	7.48%	9.97%
50%	0.12%	0.25%	0.37%	0.50%	0.62%	1.25%	2.49%	3.74%	4.98%	6.23%	9.35%	12.46%
60%	0.15%	0.30%	0.45%	0.60%	0.75%	1.50%	2.99%	4.49%	5.98%	7.48%	11.21%	14.95%
70%	0.17%	0.35%	0.52%	0.70%	0.87%	1.74%	3.49%	5.23%	6.98%	8.72%	13.08%	17.44%
80%	0.20%	0.40%	0.60%	0.80%	1.00%	1.99%	3.99%	5.98%	7.97%	9.97%	14.95%	19.94%
90%	0.22%	0.45%	0.67%	0.90%	1.12%	2.24%	4.49%	6.73%	8.97%	11.21%	16.82%	22.43%
100%	0.25%	0.50%	0.75%	1.00%	1.25%	2.49%	4.98%	7.48%	9.97%	12.46%	18.69%	24.92%

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.4.3.100 As the impact from the Mona Offshore Wind Project alone was predicted to result in a >0.05% increase in razorbill baseline mortality from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, an in-combination assessment is presented within Table 1.120 (70% displacement and 10% mortality and 70% displacement and 2% mortality).

Table 1.120: In-combination assessment for razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

a – During the breeding season age-class proportion are not able to be calculated due to the inability to age common guillemot on their plumage and therefore 100% of birds are considering adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 52.22% of birds are adults in the pre- and post-breeding period, 53.48% of birds are adults in the non-breeding period.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.639.

Project	Un-apportioned abundances (adult birds) [a]				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
Awel y Môr Offshore Wind Farm	175	No connectivity	34	79	0.0371	No connectivity	0.0371	0.0201	0.02 to 0.46	-	0.00 to 0.09	0.00 to 0.11	0.03 to 0.66	0.09	-	0.02	0.02	0.13
Burbo Bank Extension	0	No connectivity	0	15	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00	-	0.00 to 0.00	0.00 to 0.02	0.00 to 0.02	0.00	-	0.00	0.00	0.00
Erebus	468	194	892	561	0.0371	0.892[b]	0.0371	0.0201	0.05 to 1.22	0.52 to 12.11	0.10 to 2.32	0.03 to 0.79	0.70 to 16.43	0.24	2.42	0.46	0.16	3.29
Llŷr 1 Floating Offshore Wind Farm	134	21	986	259	0.0371	0.639[b]	0.0371	0.0201	0.01 to 0.35	0.04 to 0.94	0.11 to 2.56	0.02 to 0.36	0.18 to 4.21	0.07	0.19	0.51	0.07	0.84
TwinHub (Wave Hub Floating Wind Farm)	0	12	0	28	0.0371	0.639[b]	0.0371	0.0201	0.00 to 0.00	0.02 to 0.54	0.00 to 0.00	0.00 to 0.04	0.02 to 0.58	0.00	0.11	0.00	0.01	0.12
Walney (3 and 4) Extension Offshore Wind Farm	0	No connectivity	456	1609	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00	-	0.05 to 1.19	0.10 to 2.26	0.15 to 3.45	0.00	-	0.24	0.45	0.69
West of Duddon Sands Offshore Wind Farm	0	No connectivity	0	106	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00	-	0.00 to 0.00	0.01 to 0.15	0.01 to 0.15	0.00	-	0.00	0.03	0.03
West of Orkney Windfarm	51	No connectivity	75	8	0.0371	No connectivity	0.0371	0.0201	0.01 to 0.13	-	0.01 to 0.20	0.00 to 0.01	0.01 to 0.34	0.03	-	0.04	0.00	0.07
White Cross Offshore Windfarm	180	40	21	189	0.0371	0.639[b]	0.0371	0.0201	0.02 to 0.47	0.08 to 1.79	0.00 to 0.05	0.01 to 0.27	0.11 to 2.58	0.09	0.36	0.01	0.05	0.52
Morecambe Offshore Windfarm Generation Assets	199	No connectivity	362	342	0.0371	No connectivity	0.0371	0.0201	0.02 to 0.52	-	0.04 to 0.94	0.02 to 0.48	0.08 to 1.94	**0.10**	-	0.19	0.10	0.39
Morgan Offshore Wind Project Generation Assets	171	No connectivity	133	614	0.0371	No connectivity	0.0371	0.0201	0.02 to 0.44	-	0.01 to 0.34	0.04 to 0.86	0.07 to 1.65	**0.09**	-	0.07	0.17	0.33
Mona Offshore Wind Project	1,005	No connectivity	48	221	0.0371	No connectivity	0.0371	0.0201	0.11 to 2.61	-	0.01 to 0.12	0.01 to 0.31	0.13 to 3.04	0.52	-	0.02	0.06	0.61
Gap-filled projects																		
Barrow Offshore Wind Farm	2	No connectivity	1	1	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.00		0.00 to 0.00	0.00 to 0.00	0.00 to 0.01	0.00		0.19	0.10	0.39
Burbo Bank	5	No connectivity	3	5	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.07	0.17	0.33
Gwynt Y Môr Offshore Wind Farm	20	No connectivity	11	17	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.05	-	0.00 to 0.03	0.00 to 0.02	0.00 to 0.11	0.01	-	0.02	0.06	0.61
North Hoyle Offshore Wind Farm	6	No connectivity	3	5	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.01		0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00		0.00	0.00	0.00
Ormonde Offshore Wind Farm	5	No connectivity	3	4	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.01	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01

Project	Un-apportioned abundances (adult birds) [a]				Apportioning values				Apportioned displacement impact values (30-70% displacement and 1-10% mortality)					Apportioned displacement impact values (70% displacement, 2% mortality)				
	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual	Pre-breeding	Breeding	Post-breeding	Non-breeding	Annual
Robin Rigg Offshore Wind Farm	8	No connectivity	6	7	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.05	0.00	-	0.01	0.00	0.02
Rhyl Flats Offshore Wind Farm	6	No connectivity	4	5	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.02	-	0.00 to 0.01	0.00 to 0.01	0.00 to 0.03	0.00	-	0.00	0.00	0.01
Walney 1 Offshore Wind Farm and 2	21	No connectivity	13	18	0.0371	No connectivity	0.0371	0.0201	0.00 to 0.05	-	0.00 to 0.03	0.00 to 0.03	0.00 to 0.11	0.01	-	0.00	0.00	0.01
Total predicted impact (adult birds)									**0.27 to 6.38**	**0.66 to 15.38**	**0.34 to 7.93**	**0.25 to 5.76**	**1.52 to 35.44**	**1.28**	**3.08**	**1.59**	**1.15**	**7.09**
Increase in baseline mortality (%)									**0.02% to 0.51%**	**0.05% to 1.22%**	**0.03% to 0.63%**	**0.02% to 0.46%**	**0.12% to 2.81%**	**0.10%**	**0.24%**	**0.13%**	**0.09%**	**0.56%**

1.4.3.101 As the predicted impact on razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is >1% increase in baseline mortality (when considering 70% displacement and 10% mortality) the impact is further investigated by a PVA (see section 1.5.6) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

1.4.3.102 Two matrix tables are presented to indicate the varying potential impacts on razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, one (Table 1.121) showing the number of adult birds impacted at a variety of displacement and mortality rates (1-100%) and one (Table 1.122) indicating the percentage increase in baseline mortality. The colours used within the matrix table highlight the different scenarios considered regarding predicted displacement impacts for razorbill. Cells highlighted blue represent the range of displacement scenarios considered by NRW and the JNCC (30-70% displacement rates and 1-10% mortality rates), the single cell highlighted yellow represents the displacement scenario (70% displacement rate and 2% mortality rate) that has been used within the SoS's HRA for multiple east coast wind farms (70% displacement and 2% mortality) and the single cell highlighted green represents the displacement scenario (50% displacement and 1% mortality) consider by the Applicant within the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03). Cells within Table 1.122 are highlighted red when >1% is predicted, which is the threshold for undertaking a PVA (see section 1.5.6).

Table 1.121: Matrix table showing the increase in number of birds for the range of potential annual in-combination impacts from displacement on razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Displacement level (% at risk of displacement) \ Mortality level (% of displaced birds at risk of mortality)	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0	0	0	0	0	1	1	2	2	3	4	5
5%	0	1	1	1	1	3	5	8	10	13	19	25
10%	1	1	2	2	3	5	10	15	20	25	38	51
20%	1	2	3	4	5	10	20	30	41	51	76	101
30%	2	3	5	6	8	15	30	46	61	76	114	152
40%	2	4	6	8	10	20	41	61	81	101	152	203
50%	3	5	8	10	13	25	51	76	101	127	190	253
60%	3	6	9	12	15	30	61	91	122	152	228	304
70%	4	7	11	14	18	35	71	106	142	177	266	354
80%	4	8	12	16	20	41	81	122	162	203	304	405
90%	5	9	14	18	23	46	91	137	182	228	342	456
100%	5	10	15	20	25	51	101	152	203	253	380	506

Table 1.122: Matrix table showing the percentage increase in mortality rate for the range of potential annual in-combination impacts from displacement on razorbill from the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (red text indicates >1%).

Displacement level (% at risk of displacement)	Mortality level (% of displaced birds at risk of mortality)											
	1%	2%	3%	4%	5%	10%	20%	30%	40%	50%	75%	100%
1%	0.00%	0.01%	0.01%	0.02%	0.02%	0.04%	0.08%	0.12%	0.16%	0.20%	0.30%	0.40%
5%	0.02%	0.04%	0.06%	0.08%	0.10%	0.20%	0.40%	0.60%	0.80%	1.00%	1.51%	2.01%
10%	0.04%	0.08%	0.12%	0.16%	0.20%	0.40%	0.80%	1.21%	1.61%	2.01%	3.01%	4.02%
20%	0.08%	0.16%	0.24%	0.32%	0.40%	0.80%	1.61%	2.41%	3.21%	4.02%	6.03%	8.04%
30%	0.12%	0.24%	0.36%	0.48%	0.60%	1.21%	2.41%	3.62%	4.82%	6.03%	9.04%	12.05%
40%	0.16%	0.32%	0.48%	0.64%	0.80%	1.61%	3.21%	4.82%	6.43%	8.04%	12.05%	16.07%
50%	0.20%	0.40%	0.60%	0.80%	1.00%	2.01%	4.02%	6.03%	8.04%	10.04%	15.07%	20.09%
60%	0.24%	0.48%	0.72%	0.96%	1.21%	2.41%	4.82%	7.23%	9.64%	12.05%	18.08%	24.11%
70%	0.28%	0.56%	0.84%	1.12%	1.41%	2.81%	5.62%	8.44%	11.25%	14.06%	21.09%	28.12%
80%	0.32%	0.64%	0.96%	1.29%	1.61%	3.21%	6.43%	9.64%	12.86%	16.07%	24.11%	32.14%
90%	0.36%	0.72%	1.08%	1.45%	1.81%	3.62%	7.23%	10.85%	14.46%	18.08%	27.12%	36.16%
100%	0.40%	0.80%	1.21%	1.61%	2.01%	4.02%	8.04%	12.05%	16.07%	20.09%	30.13%	40.18%

1.5 Population Viability Analysis

1.5.1.1 Given the considerations set out in section 1.1.2, the Applicant would note that the worst-case scenarios set out in this section are highly conservative and should not be interpreted in isolation. The Applicant maintains the conclusions presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) are robust and sufficiently precautionary, although this Annex presents the full range of assessment scenarios as requested by the SNCBs.

1.5.1.2 Table 1.123 provides a summary of those sites and species where the increase in baseline mortality from in-combination impacts was found to exceed 1% when considering the upper displacement and mortality range recommended by the SNCBs (Table 1.2).

1.5.1.3 A PVA has been undertaken for each SPA and species which exceeds a >1% increase in baseline mortality for the worst-case displacement and mortality threshold impact for black-legged kittiwake, common guillemot, razorbill and northern gannet. PVAs have also been undertaken for the alternative approach for common guillemot (using 70% displacement rate and 2% mortality rate) and black-legged kittiwake (using 30% displacement and 3% mortality) when predicted impacts would result in an increase in baseline mortality of >1%. The results of the PVAs are presented below.

Table 1.123: Summary of colony sites where apportioned in-combination impacts result in an increase in baseline mortality of >1%.

Species	Bio season	Impact	Site	Adult bird mortalities (worst-case)	Increase in baseline mortality(worst-case)	Estimated mortalities when using alternative approach[1]	Percentage increase in baseline mortalities using alternative approach
Black-legged kittiwake	Annual	Displacement and collisions	Ailsa Craig SPA	2.38	1.66%	0.79	0.55%
			Rathlin Island SPA	40.70	1.01%	13.34	0.33%
			Lambay Island SPA	18.65	1.92%	7.00	0.72%
			Ireland's Eye SPA	7.02	1.55%	2.70	0.60%
			Howth Head Coast SPA	14.20	2.71%	5.44	1.04%
			Wicklow Head SPA	8.64	4.39%	3.09	1.57%
			Cape Wrath SPA	45.10	1.49%	15.18	0.50%
			North Colonsay and Western Cliffs SPA	14.58	1.01%	5.36	0.33%
			Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	19.08	4.16%	11.62	2.53%
Common guillemot	Annual	Displacement	Sule Skerry and Sule Stack SPA	373.71	40.14%	74.74	8.03%
			North Rona and Sula Sgeir SPA	41.06	6.73%	8.21	1.35%
			Cape Wrath SPA	228.93	6.86%	45.79	1.37%

Species	Bio season	Impact	Site	Adult bird mortalities (worst-case)	Increase in baseline mortality(worst-case)	Estimated mortalities when using alternative approach[1]	Percentage increase in baseline mortalities using alternative approach
			Handa SPA	313.50	6.76%	62.70	1.35%
			Shiant Isles SPA	42.20	6.72%	8.44	1.34%
			Flannan Isles SPA	80.35	6.72%	16.07	1.34%
			St Kilda SPA	128.74	6.72%	25.75	1.34%
			Canna and Sanday SPA	31.97	6.70%	6.39	1.34%
			Mingulay and Berneray SPA	110.91	6.72%	22.18	1.34%
			North Colonsay and Western Cliffs SPA	116.29	7.06%	23.26	1.41%
			Ailsa Craig SPA	45.27	7.07%	9.05	1.41%
			Rathlin Island SPA	753.74	7.07%	150.75	1.41%
			Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	677.68	27.83%	135.54	5.57%
Razorbill	Annual	Displacement	Cape Wrath SPA	8.89	2.02%	1.21	0.28%
			Handa SPA	19.60	1.81%	2.45	0.23%
			Shiant Isles SPA	15.58	1.75%	1.96	0.22%
			Flannan Isles SPA	3.85	1.75%	0.49	0.22%
			Mingulay and Berneray	37.02	1.74%	4.66	0.22%
			Rathlin Island	56.39	1.74%	7.10	0.22%
			Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	35.44	2.81%	7.09	0.56%
Manx shearwater	Annual	Displacement	Copeland Islands SPA	19.19	1.52%	n/a	
			Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA	64.15	1.52%	n/a	
			Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	1,546.61	1.31%	n/a	
Northern gannet	Annual	Displacement and collisions	Ailsa Craig SPA	176.65	3.28%	n/a	
			Grassholm SPA	230.77	3.96%		

Species	Bio season	Impact	Site	Adult bird mortalities (worst-case)	Increase in baseline mortality(worst-case)	Estimated mortalities when using alternative approach[1]	Percentage increase in baseline mortalities using alternative approach
			Saltee Islands	9.32	1.22%	n/a	

[1] The 'alternative approach' considered for common guillemot and razorbill using accepted displacement and mortality rates as recently accepted and used by the Secretary of State within the HRAs for Hornsea Two/Three/Four, East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard, SEP and DEP. The rates presented for common guillemot and razorbill are 70% displacement and 2% mortality (see paragraph 1.2.1.6). The rates used for black-legged kittiwake are 30% displacement and 3% mortality in accordance with the upper range of NatureScot advice (see paragraph 1.2.1.8).

1.5.2 Black-legged kittiwake

Ailsa Craig SPA

1.5.2.1 Three scenarios were modelled within the PVA for black-legged kittiwake from Ailsa Craig SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.2 For all three scenarios, the predicted impact would result in the median growth rate of ≥1 (1.000 to 1.002 after 35 years of impact), therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.124). The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.01 to 0.3% smaller).

Table 1.124: PVA outputs for black-legged kittiwake from Ailsa Craig SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2021	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	1,007	1.28%	1.013	0.808	1.168	-	-
2030	Collisions only	1,007	1.19%	1.012	0.807	1.165	0.999	0.998
2030	30% displacement and 3% mortality plus collisions	1,009	1.29%	1.013	0.807	1.167	1.000	0.999
2030	70% displacement and 10% mortality plus collisions	1,006	0.99%	1.010	0.804	1.164	0.998	0.997
2065	Baseline	1,108	11.48%	1.003	0.981	1.023	-	-
2065	Collisions only	1,081	8.33%	1.002	0.980	1.022	0.977	0.999
2065	30% displacement and 3% mortality plus collisions	1,070	7.39%	1.002	0.979	1.022	0.966	0.999
2065	70% displacement and 10% mortality plus collisions	997	-0.09%	1.000	0.977	1.020	0.899	0.997

1.5.2.3 As the results of the PVA undertaken for black-legged kittiwake from Ailsa Craig SPA indicated a stable or increasing population size (i.e. growth rate of ≥1) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Rathlin Island SPA

1.5.2.4 Three scenarios were modelled within the PVA for black-legged kittiwake from Rathlin Island SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.5 For all three scenarios, the predicted impact would result in the median growth rate of ≥1 (1.001 to 1.003 after 35 years of impact), therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.125). The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (up to 0.2% smaller when considering the worst-case scenario).

Table 1.125: PVA outputs for black-legged kittiwake from Rathlin Island SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2021	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	28,330	1.29%	1.013	0.808	1.165	-	-
2030	Collisions only	28,312	1.22%	1.012	0.808	1.162	1.000	1.000
2030	30% displacement and 3% mortality plus collisions	28,354	1.25%	1.012	0.808	1.163	1.000	0.999
2030	70% displacement and 10% mortality plus collisions	28,302	1.14%	1.011	0.808	1.163	0.998	0.998
2065	Baseline	31,228	11.84%	1.003	0.981	1.023	-	-
2065	Collisions only	30,736	10.05%	1.003	0.981	1.022	0.986	1.000
2065	30% displacement and 3% mortality plus collisions	30,598	9.64%	1.003	0.981	1.022	0.979	0.999
2065	70% displacement and 10% mortality plus collisions	29,280	5.02%	1.001	0.979	1.021	0.939	0.998

1.5.2.6 As the results of the PVA undertaken for black-legged kittiwake from Rathlin Island SPA indicated a stable or increasing population size (i.e. growth rate of ≥1) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Lambay Island SPA

1.5.2.7 Three scenarios were modelled within the PVA for black-legged kittiwake from Lambay Island SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.8 For all three scenarios, the predicted impact would result in the median growth rate of ≥1 (1.000 to 1.002 after 35 years of impact), therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.126). The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate. Therefore, the difference between the baseline and the impacted scenario is small (0.1 to 0.3% smaller).

Table 1.126: PVA outputs for black-legged kittiwake from Lambay Island SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2015	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	6,921	1.38%	1.014	0.813	1.162	-	-
2030	Collisions only	6,934	1.22%	1.012	0.813	1.163	0.999	0.999
2030	30% displacement and 3% mortality plus collisions	6,920	1.17%	1.012	0.811	1.161	0.999	0.999
2030	70% displacement and 10% mortality plus collisions	6,907	1.03%	1.010	0.809	1.161	0.997	0.997
2065	Baseline	7,663	11.13%	1.003	0.982	1.022	-	-
2065	Collisions only	7,385	7.15%	1.002	0.981	1.021	0.966	0.999
2065	30% displacement and 3% mortality plus collisions	7,326	6.39%	1.002	0.981	1.021	0.956	0.999
2065	70% displacement and 10% mortality plus collisions	6,787	-1.48%	1.000	0.979	1.019	0.887	0.997

1.5.2.9 As the results of the PVA undertaken for black-legged kittiwake from Lambay Island SPA indicated a stable or increasing population size (i.e. growth rate of ≥1) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Ireland's Eye SPA

1.5.2.10 Three scenarios were modelled within the PVA for black-legged kittiwake from Ireland's Eye SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.11 For all three scenarios, the predicted impact would result in the median growth rate of ≥1 (1.000 to 1.002 after 35 years of impact), therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.127). The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.1 to 0.3% smaller).

Table 1.127: PVA outputs for black-legged kittiwake from Ireland's Eye SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2015	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	3,235	1.35%	1.014	0.810	1.166	-	-
2030	Collisions only	3,237	1.34%	1.013	0.810	1.164	0.999	1.000
2030	30% displacement and 3% mortality plus collisions	3,231	1.23%	1.012	0.811	1.167	0.998	0.999
2030	70% displacement and 10% mortality plus collisions	3,218	1.03%	1.010	0.807	1.163	0.998	0.997
2065	Baseline	3,587	10.27%	1.003	0.982	1.022	-	-
2065	Collisions only	3,481	7.89%	1.002	0.981	1.022	0.971	0.999
2065	30% displacement and 3% mortality plus collisions	3,439	7.09%	1.002	0.981	1.021	0.965	0.999
2065	70% displacement and 10% mortality plus collisions	3,252	0.83%	1.000	0.979	1.020	0.910	0.997

1.5.2.12 As the results of the PVA undertaken for black-legged kittiwake from Ireland's Eye SPA indicated a stable or increasing population size (i.e. growth rate of ≥1) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Howth Head Coast SPA

1.5.2.13 Three scenarios were modelled within the PVA for black-legged kittiwake from Howth Head Coast SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.14 For two of three scenarios (collisions only and 30% displacement and 3% mortality), the predicted impact would result in the median growth rate of ≥1 (1.001 after 35 years of impact) and therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.128). When considering the worst-case scenario of 70% displacement and 10% mortality, the median growth rate is marginally below 1 (0.998), therefore indicating a declining population, however this predicted result only occurs when assessing an impact which is highly unlikely to occur based on empirical evidence. The counterfactual of the growth rate for all impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.1 to 0.5% smaller).

Table 1.128: PVA outputs for black-legged kittiwake from Howth Head Coast SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2015	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	3,747	1.29	1.013	0.811	1.165	-	-
2030	Collisions only	3,735	1.21	1.012	0.811	1.161	0.998	0.999
2030	30% displacement and 3% mortality plus collisions	3,737	1.27	1.013	0.810	1.163	0.999	0.998
2030	70% displacement and 10% mortality plus collisions	3,730	0.85	1.009	0.808	1.161	0.996	0.995
2065	Baseline	4,141	10.75	1.003	0.982	1.022	-	-
2065	Collisions only	3,925	5.45	1.001	0.980	1.021	0.952	0.999
2065	30% displacement and 3% mortality plus collisions	3,877	4.00	1.001	0.980	1.020	0.937	0.998
2065	70% displacement and 10% mortality plus collisions	3,487	-6.12	0.998	0.977	1.017	0.845	0.995

1.5.2.15 As the results of the PVA undertaken for black-legged kittiwake from Howth Head Coast SPA indicated a stable or increasing population size (i.e. growth rate of ≥1 when considering realistic impact scenarios) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. The worst-case scenario presented here (70% displacement and 10% mortality plus collisions) is not required by either NRW (A) or Natural England, with no other projects in the UK having to undertake this level of assessment. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three:

SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Wicklow Head SPA

1.5.2.16 Three scenarios were modelled within the PVA for black-legged kittiwake from Wicklow Head SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.17 For two of three scenarios (collisions only and 30% displacement and 3% mortality), the predicted impact would result in the median growth rate of ≥1 (1.000 to 1.001 after 35 years of impact) and therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.129). When considering the worst-case scenario of 70% displacement and 10% mortality the median growth rate is marginally below 1 (0.995), therefore indicating a declining population, however predicted impact only occurs when assessing an an impact which is highly unlikely to occur based on empirical evidence. The counterfactual of the growth rate for all impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.2 to 0.8% smaller).

Table 1.129: PVA outputs for black-legged kittiwake from Wicklow Head SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2022	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	1,388	1.59%	1.016	0.815	1.167	-	-
2030	Collisions only	1,386	1.32%	1.013	0.808	1.162	0.996	0.997
2030	30% displacement and 3% mortality plus collisions	1,385	1.32%	1.013	0.808	1.165	0.997	0.997
2030	70% displacement and 10% mortality plus collisions	1,379	0.68%	1.007	0.808	1.156	0.991	0.992
2065	Baseline	1,522	10.96%	1.003	0.981	1.022	-	-
2065	Collisions only	1,421	3.37%	1.001	0.979	1.020	0.932	0.998
2065	30% displacement and 3% mortality plus collisions	1,374	0.82%	1.000	0.979	1.020	0.906	0.997
2065	70% displacement and 10% mortality plus collisions	1,151	-15.77%	0.995	0.973	1.015	0.759	0.992

1.5.2.18 As the results of the PVA undertaken for black-legged kittiwake from Wicklow Head SPA indicated a stable or increasing population size (i.e. growth rate of ≥1 when considering realistic impact scenarios) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. The worst-case scenario presented here (70% displacement and 10% mortality plus collisions) is not required by either NRW (A) or Natural England, with no

other projects in the UK having to undertake this level of assessment. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Cape Wrath SPA

1.5.2.19 Three scenarios were modelled within the PVA for black-legged kittiwake from Cape Wrath SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.20 For all three scenarios, the predicted impact would result in the median growth rate of ≥1 (1.000 to 1.002 after 35 years of impact) and therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.130). The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.1 to 0.3% smaller).

Table 1.130: PVA outputs for black-legged kittiwake from Cape Wrath SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2000	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	22,117	1.26%	1.013	0.809	1.163	-	-
2030	Collisions only	22,101	1.16%	1.012	0.805	1.161	0.999	0.999
2030	30% displacement and 3% mortality plus collisions	22,075	1.11%	1.011	0.806	1.161	0.999	0.999
2030	70% displacement and 10% mortality plus collisions	22,071	0.92%	1.009	0.806	1.160	0.997	0.997
2065	Baseline	24,244	10.20%	1.003	0.982	1.022	-	-
2065	Collisions only	23,679	7.92%	1.002	0.981	1.022	0.978	0.999
2065	30% displacement and 3% mortality plus collisions	23,469	6.98%	1.002	0.981	1.022	0.969	0.999
2065	70% displacement and 10% mortality plus collisions	22,020	0.58%	1.000	0.979	1.020	0.911	0.997

1.5.2.21 As the results of the PVA undertaken for black-legged kittiwake from Cape Wrath SPA indicated a stable or increasing population size (i.e. growth rate of ≥1) with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

North Colonsay and Western Cliffs SPA

1.5.2.22 Three scenarios were modelled within the PVA for black-legged kittiwake from North Colonsay and Western Cliffs SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.23 For all three scenarios, the predicted impact would result in the median growth rate of ≥1 (1.001 to 1.002 after 35 years of impact), therefore indicating that the population is predicted to be stable or increasing in size under these modelled parameters (Table 1.131). The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.2% smaller under the worst-case scenario).

Table 1.131: PVA outputs for black-legged kittiwake from North Colonsay and Western Cliffs SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2000	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	11,912	1.23%	1.012	0.808	1.163	-	-
2030	Collisions only	11,917	1.20%	1.012	0.807	1.163	0.999	1.000
2030	30% displacement and 3% mortality plus collisions	11,874	1.18%	1.012	0.808	1.161	0.999	0.999
2030	70% displacement and 10% mortality plus collisions	11,885	1.04%	1.010	0.807	1.162	0.998	0.998
2065	Baseline	13,030	10.21%	1.003	0.982	1.023	-	-
2065	Collisions only	12,829	8.87%	1.002	0.982	1.022	0.986	1.000
2065	30% displacement and 3% mortality plus collisions	12,736	7.96%	1.002	0.981	1.022	0.980	0.999
2065	70% displacement and 10% mortality plus collisions	12,210	3.66%	1.001	0.980	1.021	0.939	0.998

1.5.2.24 As the results of the PVA undertaken for black-legged kittiwake from North Colonsay and Western Cliffs SPA indicated a stable or increasing population size (i.e. growth rate of ≥1) with and without the predicted impacts, it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.2.25 Three scenarios were modelled within the PVA for black-legged kittiwake Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, one considering the worst-case scenario of 70% displacement and 10% mortality, in line with the upper end of the JNCC's advice, one considering 30% displacement and 3% mortality, in line with the upper end of NatureScot guidance (NatureScot, 2023) and one considering collisions only in line with NRW (A) and Natural England advice.

1.5.2.26 The counterfactual of the growth rate indicates the impact scenarios are near to the baseline or the non-impacted predicted growth rate, therefore the difference between the baseline and the impacted scenario is small (0.7% smaller under the worst-case scenario; Table 1.132).

Table 1.132: PVA outputs for black-legged kittiwake Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2022	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	3,189	1.51	1.015	0.810	1.164	-	-
2030	Collisions only	3,173	1.18	1.012	0.809	1.159	0.997	0.996
2030	30% displacement and 3% mortality plus collisions	3,181	1.21	1.012	0.808	1.159	0.995	0.996
2030	70% displacement and 10% mortality plus collisions	3,162	0.79	1.008	0.805	1.156	0.993	0.993
2065	Baseline	3,490	11.16	1.003	0.981	1.022	-	-
2065	Collisions only	3,012	-4.01	0.999	0.977	1.018	0.865	0.996
2065	30% displacement and 3% mortality plus collisions	2,968	-5.91	0.998	0.977	1.018	0.851	0.996
2065	70% displacement and 10% mortality plus collisions	2,685	-14.70	0.996	0.974	1.015	0.768	0.993

1.5.2.27 The population of black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA has remained stable over the last 14 years of colony monitoring (since 2010). This stable population is in light of the predicted annual impact from the projects considered in-combination (Figure 1.1). The average colony count is 2,973 birds ± 450 (standard deviation) between 2010 and 2024. Therefore, the predicted population after 35 years (3,012 to 2,685 birds) of modelling is within the natural range of the population. It should also be noted that as projects are decommissioned the impact would also be removed, however the PVA is unable to take this into account.

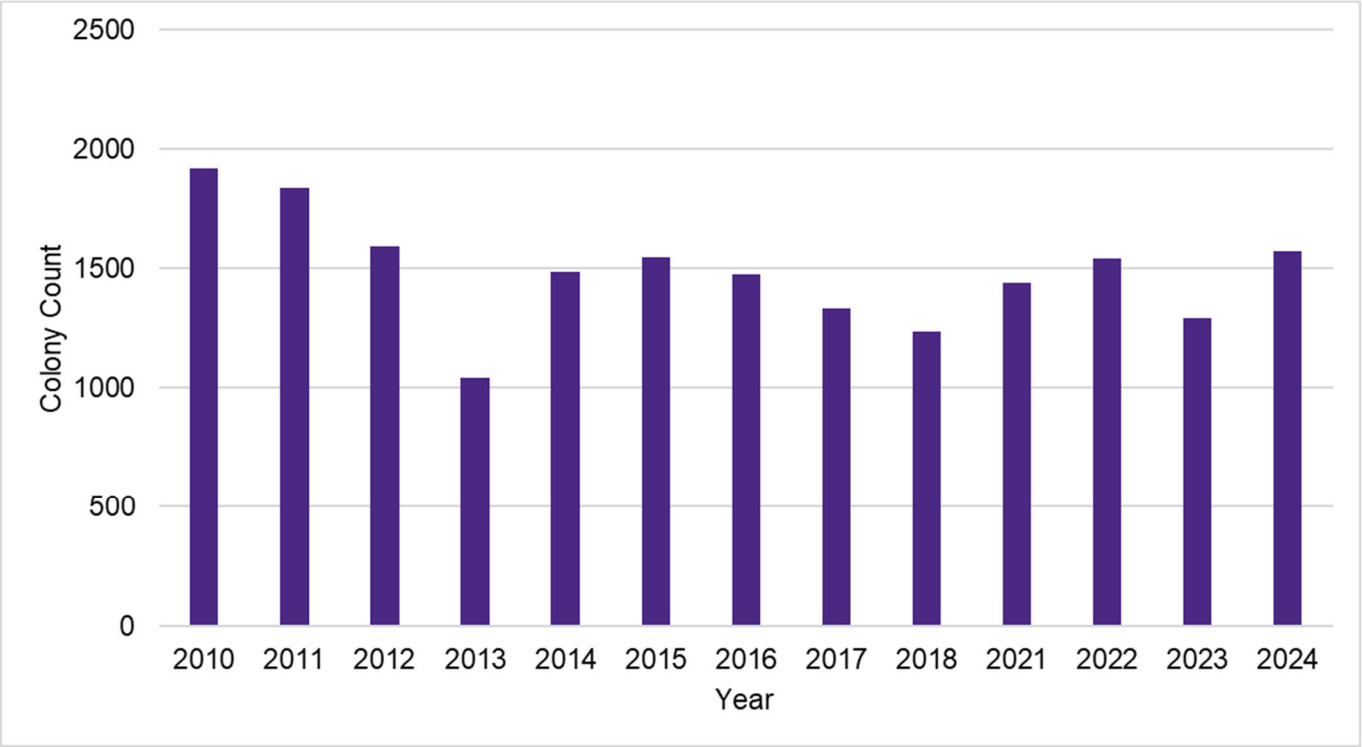

Figure 1.1: Colony count monitoring of black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

1.5.2.28 It should also be noted that tracking data on black-legged kittiwake undertaken from Skomer Island did not record birds foraging over any great distance (Trevail *et al.*, 2019 and Trevail, 2019). Within the studies 22 birds were tracked from Skomer Island and were recorded to travel 22.0 ± 2.6 km from the colony (straight line) during the breeding season. Therefore, the connectivity between the Mona Offshore Wind Project and the colony has not been empirically proven and is theoretically linked due to the work of Woodward et al. (2019). The review of foraging ranges undertaken by Woodward et al. (2019) was published before the work of Trevail *et al.* (2019), and therefore, the tracking study from Skomer was not included in the review undertaken by Woodward et al. (2019).

1.5.2.29 The predicted impact of the Mona Offshore Wind Project is 0.31 birds per annum (when considering the combined impact of collisions and displacement (assuming 70% displacement and 10% mortality)), or 10.9 birds over the predicted 35 years of the project which represents just 1.6% of the annual in-combination impact. When considering collision only (in line with NRW (A) advice) Mona Offshore Wind Project's contribution is 0.06 birds or 0.6% of the annual impact from collisions. 0.06 birds annually would multiple up to 2.1 birds over the 35 years of the project or a collision every 16.6 years.

1.5.2.30 It is important to note that black-legged kittiwake is not a qualifying feature of the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA in its own right (although it has been considered as such for the purpose of assessment), but a component of the breeding seabird assemblage alongside razorbill, common guillemot, Atlantic puffin, lesser black-backed gull, Manx shearwater and European storm petrel. As the results of the PVA undertaken for black-legged kittiwake from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicated a stable population size when compared to the long-term (10 year) average with and without the predicted impacts it can be concluded that

there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

1.5.3 Common guillemot

Ailsa Craig SPA

1.5.3.1 Two scenarios were modelled within the PVA for common guillemot from Ailsa Craig SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.2 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.133). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.133: PVA outputs for common guillemot from Ailsa Craig SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2013	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	16,085	2.71%	1.027	0.952	1.094	-	-
2030	70% displacement and 10% mortality	16,012	2.25%	1.023	0.948	1.090	0.996	0.995
2030	70% displacement and 2% mortality	16,073	2.64%	1.026	0.951	1.095	0.999	0.999
2065	Baseline	39,537	152.66%	1.026	1.017	1.035	-	-
2065	70% displacement and 10% mortality	33,275	112.38%	1.021	1.012	1.030	0.841	0.995
2065	70% displacement and 2% mortality	38,204	144.18%	1.025	1.016	1.034	0.966	0.999

1.5.3.3 As the results of the two PVAs undertaken for common guillemot from Ailsa Craig SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference

E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Canna and Sanday SPA

1.5.3.4 Two scenarios were modelled within the PVA for common guillemot from Canna and Sanday SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.5 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.134). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.134: PVA outputs for common guillemot from Canna and Sanday SPA

Year	Impact scenario	Median adult population size	Population change (%) since 1999	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	17,166	2.80%	1.028	0.952	1.095	-	-
2030	70% displacement and 10% mortality	17,099	2.34%	1.023	0.948	1.089	0.996	0.996
2030	70% displacement and 2% mortality	17,161	2.68%	1.027	0.951	1.093	0.999	0.999
2065	Baseline	42,183	152.53%	1.026	1.017	1.035	-	-
2065	70% displacement and 10% mortality	35,870	114.23%	1.021	1.012	1.030	0.848	0.995
2065	70% displacement and 2% mortality	40,883	144.45%	1.025	1.016	1.034	0.968	0.999

1.5.3.6 As the results of the two PVAs undertaken for common guillemot from Canna and Sanday SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Cape Wrath SPA

1.5.3.7 Two scenarios were modelled within the PVA for common guillemot from Cape Wrath SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.8 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.135). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.135: PVA outputs for common guillemot from Cape Wrath SPA

Year	Impact scenario	Median adult population size	Population change (%) since 2000	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	117,026	2.68%	1.096	0.951	1.096	-	-
2030	70% displacement and 10% mortality	116,503	2.21%	1.091	0.946	1.091	0.996	0.995
2030	70% displacement and 2% mortality	116,909	2.59%	1.096	0.950	1.096	0.999	0.999
2065	Baseline	288,003	152.02%	1.035	1.017	1.035	-	-
2065	70% displacement and 10% mortality	242,652	112.60%	1.030	1.012	1.030	0.843	0.995
2065	70% displacement and 2% mortality	278,235	143.63%	1.034	1.016	1.034	0.967	0.999

1.5.3.9 As the results of the two PVAs undertaken for common guillemot from Cape Wrath SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Flannan Isles SPA

1.5.3.10 Two scenarios were modelled within the PVA for common guillemot from Flanna Isles SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.11 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.136). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.136: PVA outputs for common guillemot from Flannan Isles SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 1999	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	43,035	2.78%	1.028	0.952	1.094	-	-
2030	70% displacement and 10% mortality	42,867	2.33%	1.023	0.947	1.089	0.996	0.996
2030	70% displacement and 2% mortality	42,997	2.67%	1.027	0.951	1.093	0.999	0.999
2065	Baseline	105,777	152.42%	1.026	1.017	1.035	-	-
2065	70% displacement and 10% mortality	89,847	113.94%	1.021	1.012	1.030	0.848	0.995
2065	70% displacement and 2% mortality	102,462	144.40%	1.025	1.016	1.034	0.968	0.999

1.5.3.12 As the results of the two PVAs undertaken for common guillemot from Flannan Isles SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Handa SPA

1.5.3.13 Two scenarios were modelled within the PVA for common guillemot from Handa SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.14 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.137). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.137: PVA outputs for common guillemot from Handa SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2011	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	122,813	2.75%	1.027	0.954	1.098	-	-
2030	70% displacement and 10% mortality	122,220	2.30%	1.023	0.949	1.093	0.996	0.996

Year	Impact scenario	Median adult population size	Population change (%) since 2011	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	70% displacement and 2% mortality	122,688	2.66%	1.027	0.953	1.098	0.999	0.999
2065	Baseline	301,871	152.83%	1.026	1.017	1.034	-	-
2065	70% displacement and 10% mortality	255,582	114.00%	1.021	1.012	1.030	0.846	0.995
2065	70% displacement and 2% mortality	292,085	144.57%	1.025	1.016	1.033	0.967	0.999

1.5.3.15 As the results of the two PVAs undertaken for common guillemot from Handa SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Mingulay and Berneray SPA

1.5.3.16 Two scenarios were modelled within the PVA for common guillemot from Mingulay and Berneray SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.17 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.138). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.138: PVA outputs for common guillemot from Mingulay and Berneray SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2009	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	45,844	2.73%	1.027	0.949	1.094	-	-
2030	70% displacement and 10% mortality	45,656	2.25%	1.023	0.944	1.090	0.996	0.996
2030	70% displacement and 2% mortality	45,815	2.63%	1.026	0.948	1.093	0.999	0.999
2065	Baseline	112,449	152.86%	1.026	1.017	1.034	-	-

Year	Impact scenario	Median adult population size	Population change (%) since 2009	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2065	70% displacement and 10% mortality	95,428	114.26%	1.021	1.012	1.030	0.848	0.995
2065	70% displacement and 2% mortality	108,957	144.46%	1.025	1.016	1.033	0.968	0.999

1.5.3.18 As the results of the two PVAs undertaken for common guillemot from Mingulay and Berneray SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

North Colonsay and Western Cliffs SPA

1.5.3.19 Two scenarios were modelled within the PVA for common guillemot from North Colonsay and Western Cliffs SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.20 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.139). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.139: PVA outputs for common guillemot from North Colonsay and Western Cliffs SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2000	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	57,645	2.68%	1.027	0.950	1.097	-	-
2030	70% displacement and 10% mortality	57,429	2.20%	1.022	0.946	1.091	0.995	0.995
2030	70% displacement and 2% mortality	57,650	2.58%	1.026	0.949	1.095	0.999	0.999
2065	Baseline	141,979	152.16%	1.026	1.017	1.035	-	-
2065	70% displacement and 10% mortality	119,288	111.95%	1.021	1.012	1.030	0.841	0.995

Year	Impact scenario	Median adult population size	Population change (%) since 2000	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2065	70% displacement and 2% mortality	137,105	143.38%	1.025	1.016	1.034	0.966	0.999

1.5.3.21 As the results of the two PVAs undertaken for common guillemot from North Colonsay and Western Cliffs SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives.This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

North Rona and Sula Sgeir SPA

1.5.3.22 Two scenarios were modelled within the PVA for common guillemot from North Rona and Sula Sgeir SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.23 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.140). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.140: PVA outputs for common guillemot from North Rona and Sula Sgeir SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2012	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	15,735	2.74%	1.027	0.951	1.097	-	-
2030	70% displacement and 10% mortality	15,670	2.32%	1.023	0.948	1.092	0.995	0.996
2030	70% displacement and 2% mortality	15,736	2.70%	1.027	0.952	1.097	0.999	0.999
2065	Baseline	38,606	152.77%	1.026	1.017	1.034	-	-
2065	70% displacement and 10% mortality	32,702	114.34%	1.021	1.012	1.029	0.847	0.995
2065	70% displacement and 2% mortality	37,315	144.54%	1.025	1.016	1.033	0.968	0.999

1.5.3.24 As the results of the two PVAs undertaken for common guillemot from North Rona and Sula Sgeir SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Rathlin Island SPA

1.5.3.25 Two scenarios were modelled within the PVA for common guillemot from Rathlin Island SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.26 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.141). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.141: PVA outputs for common guillemot from Rathlin Island SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2011	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	282,313	2.75%	1.027	0.953	1.098	-	-
2030	70% displacement and 10% mortality	281,150	2.27%	1.023	0.949	1.094	0.995	0.995
2030	70% displacement and 2% mortality	282,230	2.64%	1.026	0.953	1.097	0.999	0.999
2065	Baseline	694,804	152.81%	1.026	1.017	1.034	-	-
2065	70% displacement and 10% mortality	583,959	112.57%	1.021	1.012	1.029	0.841	0.995
2065	70% displacement and 2% mortality	670,652	144.25%	1.025	1.016	1.033	0.966	0.999

1.5.3.27 As the results of the two PVAs undertaken for common guillemot from Rathlin Island SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Shiant Isles SPA

1.5.3.28 Two scenarios were modelled within the PVA for common guillemot from Shiant Isles SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.29 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.142). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.142: PVA outputs for common guillemot from Shiant Isles SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2008	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	17,904	2.88%	1.029	0.953	1.096	-	-
2030	70% displacement and 10% mortality	17,837	2.39%	1.024	0.949	1.092	0.996	0.996
2030	70% displacement and 2% mortality	17,896	2.77%	1.028	0.952	1.096	0.999	0.999
2065	Baseline	43,733	151.96%	1.026	1.017	1.034	-	-
2065	70% displacement and 10% mortality	37,211	113.67%	1.021	1.013	1.030	0.848	0.995
2065	70% displacement and 2% mortality	42,429	143.94%	1.025	1.016	1.034	0.968	0.999

1.5.3.30 As the results of the two PVAs undertaken for common guillemot from Shiant Isles SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the site's conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.3.31 Two scenarios were modelled within the PVA for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.32 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the

population is predicted to increase in size under these modelled parameters (Table 1.143). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate when considering the 70% displacement and 2% mortality.

Table 1.143: PVA outputs for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro.

Year	Impact scenario	Median adult population size	Population change (%) since 2024	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	46,113	2.67%	1.027	0.952	1.092	-	-
2030	70% displacement and 10% mortality	45,827	2.03%	1.020	0.945	1.086	0.994	0.994
2030	70% displacement and 2% mortality	46,062	2.56%	1.026	0.951	1.091	0.999	0.999
2065	Baseline	112,672	151.23%	1.026	1.017	1.034	-	-
2065	70% displacement and 10% mortality	88,628	97.43%	1.019	1.010	1.027	0.786	0.993
2065	70% displacement and 2% mortality	107,544	139.59%	1.025	1.016	1.033	0.953	0.999

1.5.3.33 As the results of the two PVAs undertaken for common guillemot from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

St Kilda SPA

1.5.3.34 Two scenarios were modelled within the PVA for common guillemot from St Kilda SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.35 For both scenarios, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.144). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.144: PVA outputs for common guillemot from St Kilda SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 1999	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	68,937	2.79%	1.028	0.951	1.094	-	-
2030	70% displacement and 10% mortality	68,641	2.30%	1.023	0.948	1.090	0.996	0.996
2030	70% displacement and 2% mortality	68,843	2.68%	1.027	0.951	1.092	0.999	0.999
2065	Baseline	169,518	152.37%	1.026	1.017	1.035	-	-
2065	70% displacement and 10% mortality	143,769	114.35%	1.021	1.013	1.030	0.848	0.995
2065	70% displacement and 2% mortality	163,970	144.31%	1.025	1.016	1.034	0.968	0.999

1.5.3.36 As the results of the two PVAs undertaken for common guillemot from St Kilda SPA indicating an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Sule Skerry and Sule Stack SPA

1.5.3.37 Two scenarios were modelled within the PVA for common guillemot from Sule Skerry and Sule Stack SPA, one considering the worst-case scenario of 70% displacement and 10% mortality and one considering an alternative approach considering 70% displacement and 2% mortality.

1.5.3.38 For the alternative scenario, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.144). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate when considering the 70% displacement and 2% mortality.

1.5.3.39 The increase population is predicted to marginally decline (median growth rate of 0.998 and CGR of 0.973) under the worst case scenario of 70% displacement and 10% mortality throughout the year. The predicted impact is also based on West Of Orkney Wind Farm being consented and therefore there is potential that this level of impact never comes to fruition.

Table 1.145: PVA outputs for common guillemot from Sule Skerry and Sule Stack SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 1998	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	34,340	2.65%	1.026	0.951	1.095	-	-
2030	70% displacement and 10% mortality	33,412	-0.02%	1.000	0.925	1.068	0.974	0.974
2030	70% displacement and 2% mortality	34,155	2.15%	1.021	0.945	1.091	0.995	0.995
2065	Baseline	84,261	151.80%	1.026	1.017	1.035	-	-
2065	70% displacement and 10% mortality	31,083	-6.98%	0.998	0.989	1.007	0.369	0.973
2065	70% displacement and 2% mortality	69,167	106.92%	1.020	1.011	1.029	0.821	0.995

1.5.3.40 As the results of the two PVAs undertaken for common guillemot from Sule Skerry and Sule Stack SPA indicating an increasing population size or marginally decreasing with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

1.5.4 Northern gannet

Ailsa Craig SPA

1.5.4.1 One scenario was modelled within the PVA for northern gannet from Ailsa Craig SPA, considering the worst-case scenario of 80% displacement and 10% mortality and collisions when using the species-group avoidance rate and no macro-avoidance.

1.5.4.2 The PVA resulted in a predicted impact which indicates that median growth rate (and 95% confidence intervals) continues to be >1 and therefore indicate that the population is predicted to increase in size under these modelled parameters (Table 1.146). The counterfactual of the growth rate also indicates the impact scenario is close to the baseline or the non-impacted predicted growth rate.

Table 1.146: PVA outputs for northern gannet from Ailsa Craig SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2014	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	80,496	1.79%	1.018	0.911	1.084	-	-

Year	Impact scenario	Median adult population size	Population change (%) since 2014	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	80% displacement and 10% mortality plus collisions (no macro-avoidance)	80,300	1.48%	1.015	0.907	1.082	0.997	0.997
2065	Baseline	122,379	54.46%	1.012	1.001	1.022	-	-
2065	80% displacement and 10% mortality plus collisions (no macro-avoidance)	109,351	37.90%	1.009	0.998	1.019	0.893	0.997

1.5.4.3 As the results of the PVA undertaken for northern gannet from Ailsa Craig SPA indicate an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 70% displacement and 1% mortality and 70% macro-avoidance.

Grassholm SPA

1.5.4.4 One scenario was modelled within the PVA for northern gannet from Grassholm SPA, considering the worst-case scenario of 80% displacement and 10% mortality and collisions when using the species-group avoidance rate and no macro-avoidance. Additional PVA's have been presented at the request of NRW (A) within Appendix B:

1.5.4.5 The PVA resulted in a predicted impact which indicates that median growth rate continues to be >1 and therefore indicate that the population is predicted to increase in size under these modelled parameters (Table 1.147). The counterfactual of the growth rate also indicates the impact scenario is close to the baseline or the non-impacted predicted growth rate.

Table 1.147: PVA outputs for northern gannet from Grassholm SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2015	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	86,645	2.03%	1.020	0.913	1.085	-	-
2030	80% displacement and 10% mortality plus collisions (no macro-avoidance)	86,311	1.67%	1.017	0.909	1.082	0.996	0.996
2065	Baseline	131,362	55.39%	1.012	1.001	1.023	-	-
2065	80% displacement and 10% mortality plus collisions (no macro-avoidance)	114,832	35.38%	1.008	0.997	1.019	0.873	0.996

1.5.4.6 It should be noted that tracking work by Wakefield *et al*. (2013) highlighted that there is strong partitioning between breeding colonies and indicated that northern gannet from Grassholm do not forage within the area of the Irish Sea in which Mona Offshore Wind Project is proposed. Furthermore, there is no evidence from this study of gannet from Grassholm foraging within the northern part of the Irish Sea (limited movement to the north of the Llyn peninsula). Therefore, the results from the apportioning work (using the NatureScot approach, which is in line with best practice) that predicted 17.6% of the birds within the Array Area during the breeding period were from Grassholm SPA is not supported by evidence from tracking data (see Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document reference F6.5.5 F03) for apportioning calculations) and is therefore the predicted impact presented for this SPA is likely to be overly precautionary.

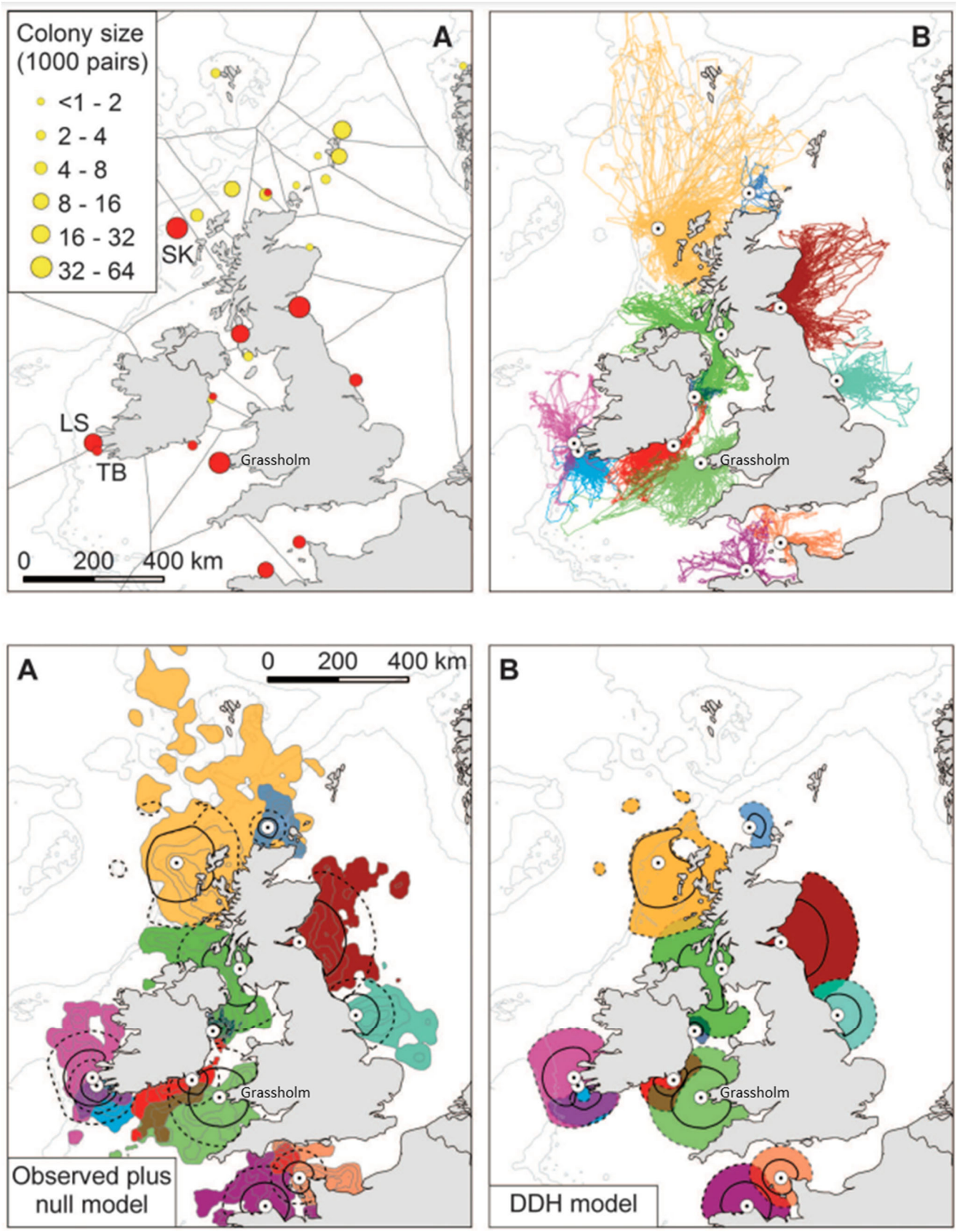

Figure 1.2: Spatial partitioning between northern gannet breeding colonies in the breeding season. Grassholm is indicated on the figure (source: Wakefield *et al*. (2013))

1.5.4.7 More recent tracking studies by Stephen Votier (unpublished but available on seabirdtracking.org), replicated the earlier results of the Wakefield *et al*. (2013) from Grassholm which showed no overlap with northern gannet from Grassholm and the Mona Offshore Wind Project location (Figure 1.3). The mean maximum foraging

distance from Grassholm was 116.8 ± 7.4 km for the 304 birds tracked from Grassholm, as part of Clark *et al.*'s (2024) review. The Mona Offshore Wind Project is 232.5 km (straight line) from Grassholm and therefore not within foraging range of northern gannet from Grassholm.

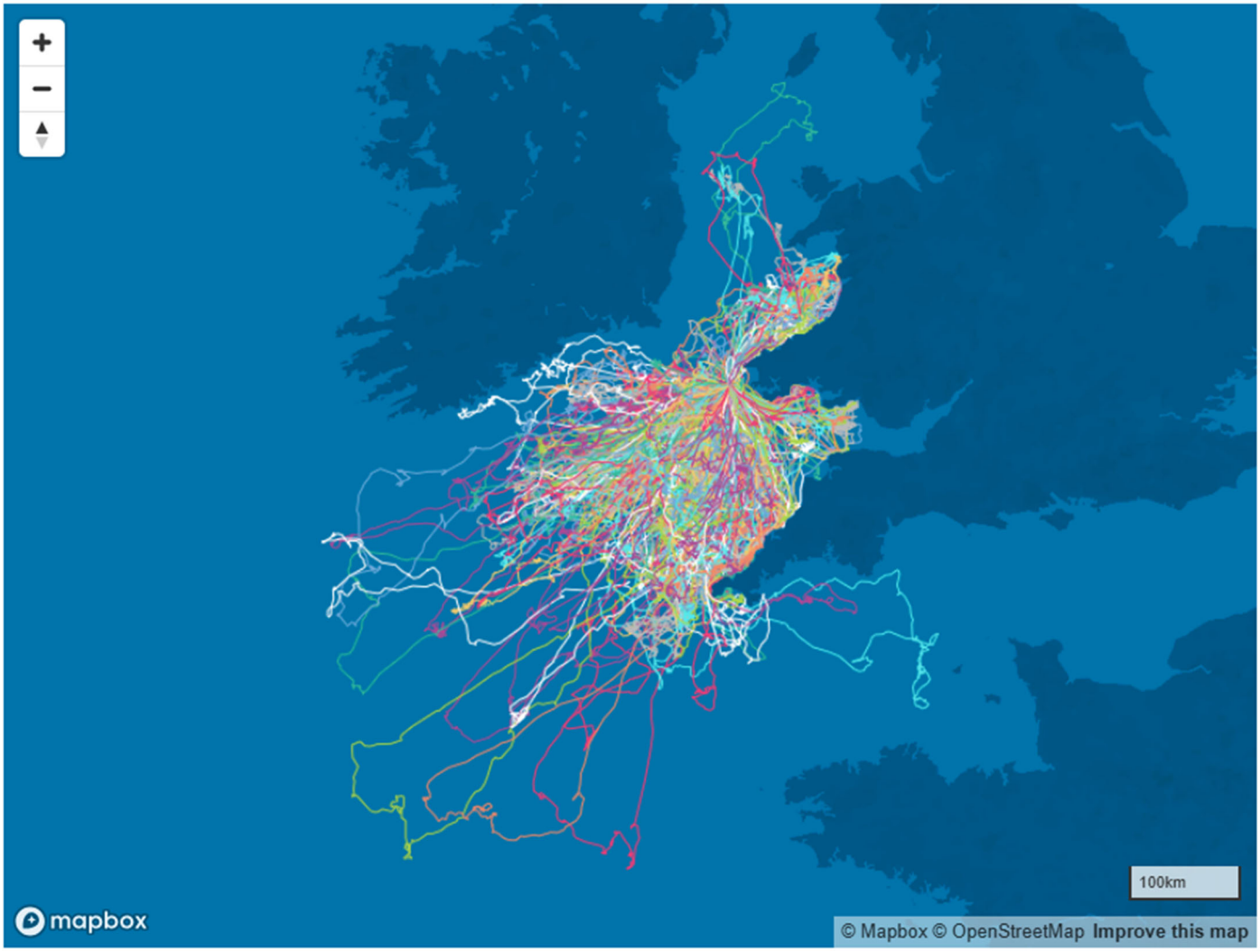

Figure 1.3: Foraging tracks of adult gannet from Grassholm during the breeding season (source: Seabirdtracking.org)

1.5.4.8 The PVAs have shown that the predicted in-combination impact would decrease the median counterfactual growth rate by between 0.01 - 0.4% under the range of scenarios modelled (assuming 60-80% displacement, 1-10% mortality and with and without any macro-avoidance applied). Under all other modelled scenarios the predicted decrease in the counterfactual of the growth rate is no greater than 1%. The northern gannet population at Grassholm SPA is predicted increase in size and to remain >30,000 pairs[1] under all modelled scenarios, and therefore, the conservation objectives for the site can be met under all impact scenarios.

[1] Countryside Council for Wales (CCW) (now part of NRW) Core Management Plan for Grassholm SPA (See Appendix O in Document Reference S_D3_25.6): CCW's aim for the gannet colony is to see it contribute towards maintaining the North Atlantic gannet population in ensure favourable conservation status. The population on Grassholm should not fall below 30,000 pairs in three consecutive years, nor should it drop by more than 25% of the previous year's igures in any one year. There should be no decline in the Grassholm/Ynys Gwales population which is significantly more than any decline in the orth Atlantic population as a whole.

1.5.4.9 The Applicant would highlight that the PVA outputs should be considered in the context of the level of precaution captured within the PVAs themselves and the input parameters. These include:

- Tracking data suggests a lack of connectivity between Grassholm SPA and the Mona Array Area and, indeed, other projects located in the Irish Sea (as outlined above) and therefore, breeding season apportionment and subsequent predicted impacts are likely to be overestimated;
- The displacement rates considered include those at the upper end of the range advised by the SNCBs for use in assessments, which are likely to overestimate mortality due to the species large foraging range and low habitat specialisation;
- Mortality rates in excess of 1% are likely to be overly precautionary (see paragraph 1.3.2.1 for further justification);
- The latest scientific evidence shows gannet to display a high level of macro-avoidance (Peschko *et al.*, 2021, Pavat *et al.*, 2023) and so scenarios which assume no macro-avoidance should be regarded as precautionary; and
- The use of consented offshore wind farm design parameters in the CRM is likely to overestimate collision impacts as offshore wind farms are rarely built out to their fully consented design and therefore the collision risk associated with constructed wind farms is often lower than predicted.

1.5.4.10 The Applicant acknowledges that northern gannet suffered from HPAI during the 2022 breeding season, resulting in a decline in the population at Grassholm (Tremlett *et al.*, 2025). Initial guidance from Natural England on the consideration of HPAI (Natural England, 2022) states that (in paragraph 4): “We expect seabird data collected prior to summer 2022 (approx. June) to remain a valid representation of ‘typical’ seabird distribution and density, as this was before mass mortality events began to take place”.

1.5.4.11 The Applicant considers that this supports the use of a population count that is contemporaneous with the site-specific baseline surveys for the Mona Offshore Wind Project (as has been used in this assessment). This guidance also sets an expectation that at a broad level, the resultant declines in colony populations will be associated with proportionate reductions in the abundance of birds from such colonies in at-sea surveys, with the consequence that the scale of impact is likely to remain in proportion to the size of the colony. Thus, the Applicant considers that the assessment presented to be sufficiently robust.

1.5.4.12 Overall, the Applicant considers that the assessment presented in this Annex demonstrates beyond reasonable scientific doubt that AEoSI on the northern gannet feature of the Grassholm SPA can be ruled for the Mona Offshore Wind Project in ombination with other plans and projects. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant’s identified assessment scenario of 70% displacement and 1% mortality and 70% macro-avoidance.

Saltee Islands SPA

1.5.4.13 One scenario was modelled within the PVA for northern gannet from Saltee Islands SPA, considering the worst-case scenario of 80% displacement and 10% mortality and collisions when using the species-group avoidance rate and no macro-avoidance.

1.5.4.14 The PVA resulted in a predicted impact which indicates that median growth rate (and 95% confidence intervals) continues to be >1 and therefore indicate that the population is predicted to increase in size under these modelled parameters (Table 1.148). The

counterfactual of the growth rate also indicates that the impact scenario is close to the baseline or the non-impacted predicted growth rate.

Table 1.148: PVA outputs for northern gannet from Saltee Islands SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2013	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	11,587	1.85%	1.018	0.909	1.085	-	-
2030	80% displacement and 10% mortality plus collisions (no macro-avoidance)	11,579	1.69%	1.017	0.906	1.084	0.999	0.999
2065	Baseline	17,684	54.87%	1.012	1.001	1.023	-	-
2065	80% displacement and 10% mortality plus collisions (no macro-avoidance)	16,960	48.56%	1.011	1.000	1.022	0.959	0.999

1.5.4.15 As the results of the PVA undertaken for northern gannet from Saltee Islands SPA indicate an increasing population size with and without the predicted impacts, it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 70% displacement and 1% mortality and 70% macroavoidance.

1.5.5 Manx shearwater

Copeland Islands SPA

1.5.5.1 One scenario was modelled within the PVA for Manx shearwater from the Copeland Islands SPA, considering the worst-case scenario of 70% displacement and 10% mortality.

1.5.5.2 For the PVA scenario, the predicted impact would result in the median growth rate continuing to be >1, therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.149). The counterfactual of the growth rate also indicates that the impact scenarios are close to the baseline or the non-impacted predicted growth rate when considering the 70% displacement and 10% mortality.

Table 1.149: PVA outputs for Manx shearwater from the Copeland Islands SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2007	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	12,440	2.46%	1.025	0.809	1.163	-	-

Year	Impact scenario	Median adult population size	Population change (%) since 2007	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	70% displacement and 10% mortality	12,433	2.22%	1.022	0.807	1.160	0.997	0.998
2065	Baseline	18,165	48.53%	1.011	0.990	1.030	-	-
2065	70% displacement and 10% mortality	16,782	37.08%	1.009	0.988	1.027	0.921	0.998

1.5.5.3 As the results of the PVA undertaken for Manx shearwater from the Copeland Islands SPA indicate an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA

1.5.5.4 One scenario was modelled within the PVA for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA, considering the worst-case scenario of 70% displacement and 10% mortality.

1.5.5.5 For the PVA scenario, the predicted impact would result in the median growth rate continuing to be >1, therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.150). The counterfactual of the growth rate also indicates that the impact scenarios are close to the baseline or the non-impacted predicted growth rate when considering the 70% displacement and 10% mortality.

Table 1.150: PVA outputs for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2001	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	44,254	2.55%	1.026	0.812	1.167	-	-
2030	70% displacement and 10% mortality	44,089	2.29%	1.023	0.810	1.165	0.998	0.998
2065	Baseline	64,648	48.49%	1.011	0.991	1.030	-	-
2065	70% displacement and 10% mortality	59,701	36.93%	1.009	0.988	1.028	0.921	0.998

1.5.5.6 As the results of the PVA undertaken for Manx shearwater from Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA indicate an increasing population size with and without the predicted impacts, it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.5.7 One scenario was modelled within the PVA for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, considering the worst-case scenario of 70% displacement and 10% mortality.

1.5.5.8 For the PVA scenario, the predicted impact would result in the median growth rate continuing to be >1, therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.151). The counterfactual of the growth rate also indicates that the impact scenarios are close to the baseline or the non-impacted predicted growth rate when considering the 70% displacement and 10% mortality.

Table 1.151: PVA outputs for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2018	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	1,033,392	2.59%	1.026	0.805	1.165	-	-
2030	70% displacement and 10% mortality	1,031,439	2.38%	1.024	0.803	1.163	0.998	0.998
2065	Baseline	1,502,390	47.99%	1.011	0.991	1.030	-	-
2065	70% displacement and 10% mortality	1,400,686	38.10%	1.009	0.989	1.028	0.932	0.998

1.5.5.9 As the results of the PVA undertaken for Manx shearwater from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicate an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

1.5.6 Razorbill

Cape Wrath SPA

1.5.6.1 One scenario was modelled within the PVA for razorbill from Cape Wrath SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.2 For the scenario, the predicted impact would result in the median growth rate continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.152). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.152: PVA outputs for razorbill from Cape Wrath SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2000	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	5,437	30.07%	1.022	0.847	1.127	-	-
2030	70% displacement and 10% mortality	5,437	30.07%	1.019	0.845	1.125	0.997	0.998
2065	Baseline	7,556	80.77%	1.010	0.992	1.026	-	-
2065	70% displacement and 10% mortality	6,903	65.14%	1.007	0.989	1.023	0.915	0.998

1.5.6.3 As the results of the PVA undertaken for razorbill from Cape Wrath SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Flannan Isles SPA

1.5.6.4 One scenario was modelled within the PVA for razorbill from Flannan Isles SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.5 For the scenario, the predicted impact would result in the median growth rate) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.153). The counterfactual of the growth rate also indicates that the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.153: PVA outputs for razorbill from Flannan Isles SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 1999	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	2802	33.30%	1.021	0.838	1.126	-	-
2030	70% displacement and 10% mortality	2797	33.06%	1.019	0.835	1.123	0.998	0.998
2065	Baseline	3836	82.49%	1.009	0.992	1.026	-	-
2065	70% displacement and 10% mortality	3559	69.29%	1.007	0.990	1.024	0.926	0.998

1.5.6.6 As the results of the PVA undertaken for razorbill from Flannan Isles SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Handa SPA

1.5.6.7 One scenario was modelled within the PVA for razorbill from Handa SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.8 For the scenario, the predicted impact would result in the median growth rate continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.154). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.154: PVA outputs for razorbill from Handa SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2010	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	12,395	19.99%	1.020	0.845	1.126	-	-
2030	70% displacement and 10% mortality	12,357	19.62%	1.018	0.844	1.124	0.998	0.998
2065	Baseline	16,934	63.93%	1.009	0.992	1.025	-	-

Year	Impact scenario	Median adult population size	Population change (%) since 2010	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2065	70% displacement and 10% mortality	15,685	51.83%	1.007	0.990	1.023	0.925	0.998

1.5.6.9 As the results of the PVA undertaken for razorbill from Handa SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Mingulay and Berneray SPA

1.5.6.10 One scenario was modelled within the PVA for razorbill from Mingulay and Berneray SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.11 For the scenario, the predicted impact would result in the median growth rate continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.155). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.155: PVA outputs for razorbill from Mingulay and Berneray SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2009	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	24,516	21.23%	1.020	0.844	1.124	-	-
2030	70% displacement and 10% mortality	24,480	21.06%	1.018	0.843	1.122	0.998	0.998
2065	Baseline	33,611	66.21%	1.009	0.991	1.026	-	-
2065	70% displacement and 10% mortality	31,190	54.24%	1.007	0.989	1.024	0.928	0.998

1.5.6.12 As the results of the PVA undertaken for razorbill from Mingulay and Berneray SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA

Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Rathlin Island SPA

1.5.6.13 One scenario was modelled within the PVA for razorbill from Rathlin Island SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.14 For the scenario, the predicted impact would result in the median growth rate (and 95% confidence intervals) continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.156). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.156: PVA outputs for razorbill from Rathlin Island SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2011	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	36,798	19.53%	1.022	0.848	1.130	-	-
2030	70% displacement and 10% mortality	36,728	19.30%	1.020	0.846	1.127	0.998	0.998
2065	Baseline	49,711	61.47%	1.009	0.991	1.025	-	-
2065	70% displacement and 10% mortality	46,020	49.48%	1.0070	0.989	1.023	0.927	0.998

1.5.6.15 As the results of the PVA undertaken for razorbill from Rathlin Island SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives . This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Shiant Isles SPA

1.5.6.16 One scenario was modelled within the PVA for razorbill from Shiant Isles SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.17 For the scenario, the predicted impact would result in the median growth rate continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.157). The counterfactual of the

growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.157: PVA outputs for razorbill from Shiant Isles SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2008	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	10,421	22.65%	1.026	0.835	1.128	-	-
2030	70% displacement and 10% mortality	10,397	22.37%	1.022	0.833	1.126	0.998	0.998
2065	Baseline	14,212	67.27%	1.009	0.991	1.026	-	-
2065	70% displacement and 10% mortality	13,146	54.73%	1.007	0.989	1.024	0.927	0.998

1.5.6.18 As the results of the PVA undertaken for razorbill from Shiant Isles SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

1.5.6.19 One scenario was modelled within the PVA for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, considering the worst-case scenario of 70% displacement and 10% mortality. A PVA was not undertaken for the alternative approach (considering 70% displacement and 2% mortality) due to the impact predicted being <1% increase in baseline mortality and therefore not requiring a PVA (Parker *et al.*, 2023).

1.5.6.20 For the scenario, the predicted impact would result in the median growth rate continuing to be >1 and therefore indicating that the population is predicted to increase in size under these modelled parameters (Table 1.158). The counterfactual of the growth rate also indicates the impact scenarios are close to the baseline or the non-impacted predicted growth rate.

Table 1.158: PVA outputs for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2013	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	14,023	16.83%	1.022	0.840	1.129	-	-

Year	Impact scenario	Median adult population size	Population change (%) since 2013	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	70% displacement and 10% mortality	13,970	16.40%	1.018	0.837	1.126	0.997	0.997
2065	Baseline	19,205	60.01%	1.009	0.992	1.025	-	-
2065	70% displacement and 10% mortality	17,033	41.92%	1.006	0.988	1.022	0.885	0.997

1.5.6.21 As the results of the PVA undertaken for razorbill from Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA indicated an increasing population size with and without the predicted impacts it can be concluded that there is no AEoSI, beyond reasonable scientific doubt, when considering the Mona Offshore Wind Project in-combination with other plans and projects. On coming to this conclusion, the Applicant has considered the sites conservation objectives. This conclusion is consistent with that presented in the HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03) based on the Applicant's identified assessment scenario of 50% displacement and 1% mortality.

1.6 Conclusions

1.6.1.1 This Annex to the HRA provides an assessment of the impacts on SPAs and gives full regard to the SNCB advice that was received both pre-application and post-application during the pre-examination and examination process. When considering the SNCB's advised range of displacement impacts for each species and approach to apportioning impacts to the relevant SPAs, several additional SPAs are taken through to an in-combination assessment when compared to HRA Stage 2 ISAA Part Three: SPA and Ramsar sites Assessments (Document Reference E1.3 F03). The in-combination assessments (section 1.4.3) also resulted in several additional SPAs requiring PVAs as the predicted impacts found an increase in baseline mortality of >1%.

1.6.1.2 The range-based scenarios were presented for black-legged kittiwake, common guillemot, northern gannet, Manx shearwater, and razorbill as requested by the SNCBs. Common guillemot was also modelled within the PVAs, considering an alternative approach using the 70% displacement and 2% mortality. Black-legged kittiwake was also modelled within the PVAs assuming collision only (in line with NRW (A) advice) and 30% displacement and 3% mortality, which is in line with NatureScot's guidance (NatureScot, 2023) and used in displacement assessments for offshore wind farm within Scottish waters

1.6.1.3 As set out in section 1.1.2, the Applicant considers that the use of both the highest levels of displacement and the highest levels of mortality results in unrealistic outputs that are not supported by the available evidence. In addition, the approach suggested by NRW (A) and JNCC to assume that all unaged birds recorded during the site-specific surveys for all cumulative projects are adult birds is over-precautionary and considered to be biologically unrealistic given that populations will always include a material proportion of immature birds. Therefore, the Applicant's position is that the assessments presented within this annex hyperinflate the potential impacts and do not use the 'best-scientific' evidence on the age-class structures and displacement rates.

1.6.1.4 Notwithstanding this, for all species and sites assessed within this note, the Applicant's conclusion remains as presented within the application (HRA Stage 2 ISAA Part Three: SPA and Ramsar sites Assessments (Document Reference E1.3 F03)) which is that AEoSI from the Mona Offshore Wind Project in-combination with other projects and plans can be ruled out beyond reasonable scientific doubt.

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Appendix A: PVA modelling parameters

A.1.1.1.1 Due to the number of PVAs run for this projects summary information and tables are presented below to provide the SNCBs with the information required to undertake a recreation of the PVA outputs. Individual PVA modelling sheets are available on request.

A.1.1.1.2 All PVAs were run using: Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7).

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1 Basic PVA information

A.1.1.1.3 Each of the models were run using the following basic information:

This run had reference name "*[Varied for each model run]*".
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2 Population

A.1.1.1.4 The population used within the PVAs is presented within the Mona Offshore Wind Project apportioning tables (section 1.4.1 for species considering for displacement (black-legged kittiwake, common guillemot, northern gannet and razorbill) and section 1.4.2 for species considered for collision (black-legged kittiwake, northern gannet and great black-backed gull)).

A.3 Basic demographic rates

A.1.1.1.5 The basic demographic rates are presented within Table 1.159. The Applicant has used the input parameters for most species that are inbuilt to the PVA shiny app. The productivity was provided by the BTO and uses data from the seabird monitoring programme from 2010 to 2019.

Table 1.159: Baseline demographic rates for each species which required a PVA

Parameter	Black-legged kittiwake	Common guillemot	Northern gannet	Manx shearwater	Great black-backed gull	Razorbill
Productivity	Mean: 0.619 SD: 0.121	Mean: 0.583 SD: 0.075	Mean: 0.766 SD: 0.051	Mean: 0.600 SD: 0.066	Mean: 1.016 SD: 0.125	Mean: 0.532 SD: 0.084
Adult survival rate	Mean: 0.854 SD: 0.077	Mean: 0.94 SD: 0.025	Mean: 0.922 SD: 0.019	Mean: 0.87 SD: 0.080	Mean: 0.93 SD: 0.001	Mean: 0.895 SD: 0.067
Age class 0 to 1 survival rate	Mean: 0.79 SD: 0.001	Mean: 0.56 SD: 0.058	Mean: 0.42 SD: 0.084	Mean: 0.79 SD: 0.001	0. Mean: 0.798 SD: 0.001	Mean: 0.794 SD: 0.001
Age class 1 to 2 survival rate	Mean: 0.854 SD: 0.077	Mean: 0.792 SD: 0.152	Mean: 0.852 SD: 0.032	Mean: 0.854 SD: 0.077	Mean: 0.93 SD: 0.001	Mean: 0.794 SD: 0.001
Age class 2 to 3 survival rate	Mean: 0.854 SD: 0.077	Mean: 0.917 SD: 0.098	Mean: 0.908 SD: 0.026	Mean: 0.854 SD: 0.077	Mean: 0.93 SD: 0.001	Mean: 0.895 SD: 0.067
Age class 3 to 4 survival rate	Mean: 0.854 SD: 0.077	Mean: 0.938 SD: 0.107	Mean: 0.91 SD: 0.026	Mean: 0.854 SD: 0.077	Mean: 0.93 SD: 0.001	Mean: 0.895 SD: 0.067
Age class 4 to 5 survival rate	Mean: 0.854 SD: 0.077	Mean: 0.94 SD: 0.025	Mean: 0.922 SD: 0.019	Mean: 0.854 SD: 0.077	Mean: 0.93 SD: 0.001	Mean: 0.895 SD: 0.067
Age class 5 to 6 survival rate	N/A	Mean: 0.94 SD: 0.025	N/A	N/A	N/A	N/A

A.4 Impacts

A.1.1.1.6 The impacts for each site can be generated by dividing the in-combination impact (section 1.4.3 and summarised in Table 1.123) by the population presented within the Mona Offshore Wind Project apportioning tables (section 1.4.1 for species considering for displacement (black-legged kittiwake, common guillemot, northern gannet and razorbill) and section 1.4.2 for species considered for collision (black-legged kittiwake, northern gannet and great black-backed gull)).

A.5 Outputs

A.1.1.1.7 All PVAs were run from 2030 to 2065, in line with the predicted lifetime of the Mona Offshore Wind Project.

Appendix B: In-combination assessment tables for northern gannet from Grassholm SPA which account for macro-avoidance

B.1 Introduction

A.1.1.1.8 NRW (A)'s most recent advice received on 16 December 2024 indicated that an assessment of Grassholm SPA should take account of macro-avoidance. This Appendix has been presented which provides NRW (A) with macro-avoidance taken into account in the collision estimates. Two macro-avoidance scenarios have been presented, one where 70% macro-avoidance is applied year-round and one where 70% macro-avoidance is applied during the non-breeding season. Both are considered noting there is contrasting SNCB advice as to the appropriateness of year-round vs non-breeding only macro-avoidance (D.3.13 and D.7.3 of Technical Engagement Plan Appendices - Part 1 (A to E) (Document Reference E4.1 F01) and the Joint SNCB Advice Note, 2024[2]). The review by Pavat *et al*. (2023) commissioned by Natural England stated a year-round mean macro-avoidance should be applied; however, there is some expert opinion that during the breeding season birds are more likely to get closer to turbines and less likely to be displaced due to the need to provision chicks (Pavat *et al*, 2023).

B.2 In-combination assessments

A.1.1.1.9 The Applicant has provided two in-combination assessments which account for 70% macro-avoidance in the collision estimates, one when has macro-avoidance applied only in the non-breeding season (Table 1-160) and one when macro-avoidance is applied annually (Table 1-161).

[2] Within the 'Joint advice note from the Statutory Nature Conservation Bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments' note there is acknowledgment that consultation with the respective SNCB is required if macro-avoidance is undertaken or not and for which season.

B.2.1 Northern gannet from Grassholm SPA – with 70% macro-avoidance during the non-breeding season

A.1.1.1.10 An in-combination assessment is presented within Table 1-160 (the values presented represent 60-80% displacement and 1-10% mortality and the species-group avoidance rate). The displacement (60-80%) and mortality (1-10%) rates were requested during the EWGs. The collision estimates have been reduced to account for 70% macro-avoidance, as a bird cannot be displaced and also susceptible to collision at the same time. Macro-avoidance has been applied during the non-breeding season only.

Table 1-160: In-combination assessment for northern gannet from the Grassholm SPA with 70% macro-avoidance during the non-breeding season.

a – During the breeding season site-specific age-class values have been used for Awel y Mor (93.5%), Erebus Floating Wind Project (99.0%), Llŷr Floating Offshore Wind Project (95.99%), Mona Offshore Wind Project (93.58%), Morecambe Generation Assets (73.3%) and Morgan Generation Assets (94.94%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 59.16% of birds are adults in the pre-breeding period and 58.25% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.258.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.367.

e – the apportioning value during the breeding seas has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.969.

f – the Applicant has presented the collision impacts using a 99.28% avoidance rate and a 70% macro-avoidance, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds [a])			Un-apportioned collision impacts (adult birds [a]) (species-group avoidance rate 0.9928 and 70% macro-avoidance during the non-breeding season)[f]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 1-10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and 70% macro-avoidance during the non-breeding season)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	0	307	117	0.00	10.17	0.44	0.2007	0.367[b]	0.2471	0.00 to 0.00	0.68 to 9.00	0.17 to 2.31	0.00	3.73	0.11	0.00 to 0.00	4.41 to 12.74	0.28 to 2.43	4.69 to 15.16
Burbo Bank Extension Offshore Wind Farm	15	648	13	0.00	12.44	0.00	0.2007	0.367[d]	0.2471	0.02 to 0.24	1.43 to 19.03	0.02 to 0.25	0.00	4.56	0.00	0.02 to 0.24	5.99 to 23.59	0.02 to 0.25	6.03 to 24.08
Erebus Floating Wind Project	59	222	195	0.36	3.34	0.35	0.2007	0.995[b]	0.2471	0.07 to 0.95	1.32 to 17.65	0.29 to 3.85	0.07	3.32	0.09	0.14 to 1.02	4.64 to 20.97	0.38 to 3.93	5.10 to 25.87
TwinHub (Wave Hub Floating Wind Farm)	0	244	89	0.00	26.12	0.00	0.2007	0.969[e]	0.2471	0.00 to 0.00	1.46 to 18.91	0.13 to 1.76	0.00	25.31	0.00	0.00 to 0.00	26.73 to 44.23	0.13 to 1.76	26.86 to 45.99
Llŷr 1 Floating Offshore Wind Farm	38	236	416	0.05	2.88	0.09	0.2007	0.969[b]	0.2471	0.05 to 0.62	1.37 to 18.31	0.62 to 8.23	0.01	2.79	0.02	0.06 to 0.63	4.16 to 21.10	0.64 to 8.26	4.86 to 29.98
Mona Offshore Wind Project	17	235	34	0.07	4.43	0.09	0.2007	0.176[b]	0.2471	0.02 to 0.27	0.25 to 3.31	0.05 to 0.67	0.01	0.78	0.02	0.03 to 0.28	1.03 to 4.09	0.07 to 0.69	1.13 to 5.06
Morecambe Generation Assets	5	397	72	0.00	0.91	0.00	0.2007	0.3141[b]	0.2471	0.01 to 0.08	0.75 to 9.96	0.11 to 1.43	0.00	0.29	0.00	0.01 to 0.08	1.03 to 10.25	0.11 to 1.43	1.15 to 11.76
Morgan Generation Assets	21	139	38	0.00	0.37	0.01	0.2007	0.258[b]	0.2471	0.02 to 0.33	0.21 to 2.86	0.06 to 0.75	0.00	0.10	0.01	0.02 to 0.33	0.32 to 3.11	0.06 to 0.76	0.41 to 4.20
Ormonde Wind Farm	2	199	3	0.00	6.72	0.00	0.2007	0.258[c]	0.2471	0.00 to 0.03	0.31 to 4.11	0.01 to 0.07	0.00	1.73	0.00	0.00 to 0.03	2.04 to 5.84	0.01 to 0.07	2.05 to 5.94
Walney (3 and 4) Extension Offshore Wind Farm	14	150	151	0.16	16.30	2.89	0.2007	0.258[c]	0.2471	0.02 to 0.23	0.23 to 3.10	0.22 to 2.98	0.03	4.20	0.73	0.05 to 0.26	4.44 to 7.30	0.95 to 3.71	5.43 to 11.26
West of Duddon Sands Offshore Wind Farm	7	431	10	0.05	1.96	0.06	0.2007	0.258[c]	0.2471	0.01 to 0.10	0.67 to 8.90	0.02 to 0.21	0.01	0.51	0.01	0.02 to 0.11	1.17 to 9.40	0.03 to 0.22	1.22 to 9.74
West of Orkney Windfarm	35	958	682	0.37	33.80	2.26	0.2007	No connectivity	0.2471	0.04 to 0.56	-	1.01 to 13.48	0.07	-	0.57	0.12 to 0.64	N/A	1.58 to 14.05	1.69 to 14.68
White Cross Offshore Windfarm	83	239	44	0.00	4.42	0.30	0.2007	0.5208[b]	0.2471	0.10 to 1.34	0.75 to 9.96	0.07 to 0.88	0.00	2.30	0.07	0.10 to 1.34	3.05 to 12.26	0.14 to 0.95	3.29 to 14.55
Gap-filled projects																			
Barrow Offshore Wind Farm	0	2	1	0.01	0.36	0.01	0.2007	0.258[b]	0.2471	0.00 to 0.03	0.01 to 0.17	0.01 to 0.07	0.00	0.09	0.00	0.00 to 0.03	0.11 to 0.26	0.01 to 0.07	0.12 to 0.36
Burbo Bank	2	6	3	0.01	0.36	0.01	0.2007	0.367[d]	0.2471	0.00 to 0.03	0.01 to 0.18	0.00 to 0.06	0.00	0.13	0.00	0.00 to 0.03	0.15 to 0.31	0.01 to 0.06	0.16 to 0.40

Project	Un-apportioned abundances (adult birds [a])			Un-apportioned collision impacts (adult birds [a]) (species-group avoidance rate 0.9928 and 70% macro-avoidance during the non-breeding season)[f]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 1-10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and 70% macro-avoidance during the non-breeding season)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Gwynt y Môr Offshore Wind Farm	8	27	12	0.18	7.30	0.22	0.2007	0.367[d]	0.2471	0.01 to 0.12	0.06 to 0.79	0.02 to 0.23	0.04	2.68	0.05	0.05 to 0.16	2.74 to 3.47	0.07 to 0.28	2.85 to 3.92
North Hoyle Offshore Wind Farm	0	3	1	0.02	0.74	0.02	0.2007	0.367[d]	0.2471	0.00 to 0.03	0.02 to 0.20	0.00 to 0.06	0.00	0.27	0.01	0.01 to 0.03	0.29 to 0.47	0.01 to 0.06	0.30 to 0.56
Robin Rigg	2	11	4	0.02	0.70	0.02	0.2007	0.258[c]	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.08	0.00	0.18	0.01	0.01 to 0.04	0.20 to 0.41	0.01 to 0.09	0.21 to 0.53
Rhyl Flats Offshore Wind Farm	2	8	3	0.07	1.04	0.03	0.2007	0.367[d]	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.07	0.01	0.38	0.01	0.02 to 0.05	0.40 to 0.62	0.01 to 0.08	0.43 to 0.75
Walney 1 and 2	9	36	15	0.05	1.91	0.06	0.2007	0.258[c]	0.2471	0.01 to 0.14	0.06 to 0.74	0.02 to 0.30	0.01	0.49	0.01	0.02 to 0.15	0.55 to 1.24	0.04 to 0.31	0.60 to 1.70
Total predicted impact (adult birds)										**0.38 to 5.11**	**9.56 to 127.42**	**2.82 to 37.61**	**0.29**	**53.86**	**1.73**	**0.68 to 5.45**	**63.44 to 181.64**	**4.56 to 39.46**	**68.58 to 226.46**
Increase in baseline mortality (%) (baseline mortality of 5,834)										**0.01% to 0.16%**	**0.31% to 4.10%**	**0.09% to 1.21%**	**0.00%**	**0.92%**	**0.03%**	**0.01% to 0.09%**	**1.09% to 3.11%**	**0.08% to 0.68%**	**1.18% to 3.88%**

A.1.1.1.11 As the predicted impact on northern gannet from Grasholm SPA is predicted to be >1% increase in baseline mortality under several scenarios, the impact is further investigated by a PVA (see section B.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

B.2.2 Northern gannet from Grassholm SPA – with 70% macro-avoidance annually

A.1.1.1.12 An in-combination assessment is presented within Table 1-161 (the values presented represent 60-80% displacement and 1-10% mortality and the species-group avoidance rate). The displacement (60-80%) and mortality (1-10%) rates were requested during the EWGs. The collision estimates have been reduced to account for 70% macro-avoidance, as a bird can not be displaced and also susceptible to collision at the same time. Macro-avoidance has been applied year round.

Table 1-161: In-combination assessment for northern gannet from the Grassholm SPA with 70% macro-avoidance annually.

a – During the breeding season site-specific age-class values have been used for Awel y Mor (93.5%), Erebus Floating Wind Project (99.0%), Llŷr Floating Offshore Wind Project (95.99%), Mona Offshore Wind Project (93.58%), Morecambe Generation Assets (73.3%) and Morgan Generation Assets (94.94%) or where no site-specific data was available, 100% of birds are assumed to be adults. During the non-breeding season the age-class proportions are derived from the adult/immature proportion from the Appendix tables of (Furness, 2015) which are 59.16% of birds are adults in the pre-breeding period and 58.25% of birds are adults in the post-breeding season.

b – the apportioning value during the breeding season was taken from project specific documentation (Awel y Môr, 2022; Erebus, 2021b; Llŷr 1 Floating Offshore Wind Farm, 2024b; Morgan Generation Assets, 2024b; Volume 6, Annex 5.5: Offshore Ornithology Apportioning Technical Report (Document Reference F6.5.5); Morecambe Generation Assets, 2024b)

c – the apportioning value during the breeding season has used that of Morgan Offshore Wind Project Generation Assets, specifically 0.258.

d – the apportioning value during the breeding season has used that of Awel y Môr Offshore Wind Farm, specifically 0.367.

e – the apportioning value during the breeding seas has used that of Llŷr 1 Floating Offshore Wind Farm, specifically 0.969.

f – the Applicant has presented the collision impacts using a 99.28% avoidance rate and a 70% macro-avoidance, therefore some of the numbers presented have been corrected from the original application documents for some sites.

Project	Un-apportioned abundances (adult birds [a])			Un-apportioned collision impacts (adult birds [a]) (species-group avoidance rate 0.9928 and 70% macro-avoidance annually)[f]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 1-10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and 70% macro-avoidance annually)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Awel y Môr Offshore Wind Farm	0	307	117	0.00	3.05	0.44	0.2007	0.367[b]	0.2471	0.00 to 0.00	0.68 to 9.00	0.17 to 2.31	0.00	1.12	0.11	0.00 to 0.00	1.38 to 9.71	0.28 to 2.43	1.67 to 12.14
Burbo Bank Extension Offshore Wind Farm	15	648	13	0.00	3.73	0.00	0.2007	0.367[d]	0.2471	0.02 to 0.24	1.43 to 19.03	0.02 to 0.25	0.00	1.37	0.00	0.02 to 0.24	2.24 to 19.84	0.02 to 0.25	2.27 to 20.33
Erebus Floating Wind Project	59	222	195	0.36	3.34	0.35	0.2007	0.995[b]	0.2471	0.07 to 0.95	1.32 to 17.65	0.29 to 3.85	0.07	3.32	0.09	0.14 to 1.02	4.64 to 20.97	0.38 to 3.93	5.16 to 25.93
TwinHub (Wave Hub Floating Wind Farm)	0	244	89	0.00	7.84	0.00	0.2007	0.969[e]	0.2471	0.00 to 0.00	1.46 to 18.91	0.13 to 1.76	0.00	7.59	0.00	0.00 to 0.00	5.91 to 23.41	0.13 to 1.76	6.04 to 25.17

MONA OFFSHORE WIND PROJECT

Project	Un-apportioned abundances (adult birds [a])			Un-apportioned collision impacts (adult birds [a]) (species-group avoidance rate 0.9928 and 70% macro-avoidance annually)[f]			Apportioning values			Apportioned displacement impact values (60-80% displacement and 1-10% mortality)			Apportioned collision (species-group avoidance rate 0.9928 and 70% macro-avoidance annually)			Combined impact			
	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Annual
Llŷr 1 Floating Offshore Wind Farm	38	236	416	0.05	0.86	0.09	0.2007	0.969[b]	0.2471	0.05 to 0.62	1.37 to 18.31	0.62 to 8.23	0.01	0.84	0.02	0.06 to 0.63	1.89 to 18.82	0.64 to 8.26	2.59 to 27.70
Mona Offshore Wind Project	17	235	34	0.07	1.33	0.09	0.2007	0.176[b]	0.2471	0.02 to 0.27	0.25 to 3.31	0.05 to 0.67	0.01	0.23	0.02	0.03 to 0.28	0.40 to 3.45	0.07 to 0.69	0.50 to 4.43
Morecambe Generation Assets	5	397	72	0.00	0.91	0.00	0.2007	0.3141[b]	0.2471	0.01 to 0.08	0.75 to 9.96	0.11 to 1.43	0.00	0.29	0.00	0.01 to 0.08	1.03 to 10.25	0.11 to 1.43	1.15 to 11.76
Morgan Generation Assets	21	139	38	0.00	0.37	0.01	0.2007	0.258[b]	0.2471	0.02 to 0.33	0.21 to 2.86	0.06 to 0.75	0.00	0.10	0.01	0.02 to 0.33	0.32 to 3.11	0.06 to 0.76	0.41 to 4.20
Ormonde Wind Farm	2	199	3	0.00	2.02	0.00	0.2007	0.258[c]	0.2471	0.00 to 0.03	0.31 to 4.11	0.01 to 0.07	0.00	0.52	0.00	0.00 to 0.03	0.62 to 4.42	0.01 to 0.07	0.62 to 4.51
Walney (3 and 4) Extension Offshore Wind Farm	14	150	151	0.16	4.89	2.89	0.2007	0.258[c]	0.2471	0.02 to 0.23	0.23 to 3.10	0.22 to 2.98	0.03	1.26	0.73	0.05 to 0.26	0.98 to 3.84	0.95 to 3.71	1.98 to 7.81
West of Duddon Sands Offshore Wind Farm	7	431	10	0.05	0.59	0.06	0.2007	0.258[c]	0.2471	0.01 to 0.10	0.67 to 8.90	0.02 to 0.21	0.01	0.15	0.01	0.02 to 0.11	0.76 to 8.99	0.03 to 0.22	0.80 to 9.32
West of Orkney Windfarm	35	958	682	0.37	10.14	2.26	0.2007	No connectivity	0.2471	0.04 to 0.56	-	1.01 to 13.48	0.07	-	0.57	0.12 to 0.64	-	1.58 to 14.05	1.69 to 14.69
White Cross Offshore Windfarm	83	239	44	0.00	1.33	0.30	0.2007	0.5208[b]	0.2471	0.10 to 1.34	0.75 to 9.96	0.07 to 0.88	0.00	0.69	0.07	0.10 to 1.34	1.16 to 10.37	0.14 to 0.95	1.40 to 12.65
Gap-filled projects																			
Barrow Offshore Wind Farm	0	2	1	0.01	0.11	0.01	0.2007	0.258[b]	0.2471	0.00 to 0.03	0.01 to 0.17	0.01 to 0.07	0.00	0.03	0.00	0.00 to 0.03	0.03 to 0.18	0.01 to 0.07	0.04 to 0.28
Burbo Bank	2	6	3	0.01	0.11	0.01	0.2007	0.367[d]	0.2471	0.00 to 0.03	0.01 to 0.18	0.00 to 0.06	0.00	0.04	0.00	0.00 to 0.03	0.04 to 0.20	0.01 to 0.06	0.05 to 0.29
Gwynt y Môr Offshore Wind Farm	8	27	12	0.18	2.19	0.22	0.2007	0.367[d]	0.2471	0.01 to 0.12	0.06 to 0.79	0.02 to 0.23	0.04	0.80	0.05	0.05 to 0.16	0.53 to 1.27	0.07 to 0.28	0.65 to 1.71
North Hoyle Offshore Wind Farm	0	3	1	0.02	0.22	0.02	0.2007	0.367[d]	0.2471	0.00 to 0.03	0.02 to 0.20	0.00 to 0.06	0.00	0.08	0.01	0.01 to 0.03	0.06 to 0.24	0.01 to 0.06	0.08 to 0.34
Robin Rigg	2	11	4	0.02	0.21	0.02	0.2007	0.258[c]	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.08	0.00	0.05	0.01	0.01 to 0.04	0.05 to 0.26	0.01 to 0.09	0.07 to 0.39
Rhyl Flats Offshore Wind Farm	2	8	3	0.07	0.31	0.03	0.2007	0.367[d]	0.2471	0.00 to 0.04	0.02 to 0.23	0.01 to 0.07	0.01	0.11	0.01	0.02 to 0.05	0.09 to 0.30	0.01 to 0.08	0.12 to 0.43
Walney 1 and 2	9	36	15	0.05	0.57	0.06	0.2007	0.258[c]	0.2471	0.01 to 0.14	0.06 to 0.74	0.02 to 0.30	0.01	0.15	0.01	0.02 to 0.15	0.14 to 0.83	0.04 to 0.31	0.20 to 1.30
Total predicted impact (adult birds)										**0.38 to 5.11**	**9.56 to 127.42**	**2.82 to 37.61**	**0.29**	**18.75**	**1.73**	**0.68 to 5.45**	**28.33 to 146.53**	**4.46 to 39.37**	**33.47 to 191.35**
Increase in baseline mortality (%) (baseline mortality of 5,834)										**0.01% to 0.16%**	**0.31% to 4.10%**	**0.09% to 1.21%**	**0.00%**	**0.32%**	**0.03%**	**0.01% to 0.09%**	**0.49% to 2.51%**	**0.08% to 0.67%**	**0.57% to 3.28%**

A.1.1.1.13 As the predicted impact on northern gannet from Grasholm SPA is predicted to be >1% increase in baseline mortality under several scenarios, the impact is further investigated by a PVA (see section B.3) to determine whether AEoSI can be ruled out beyond reasonable scientific doubt.

B.3 Population Viability Analysis

A.1.1.1.14 A PVA has been undertaken for northern gannet from Grassholm SPA which exceeds a >1% increase in baseline mortality for the upper displacement and mortality range as advised by the SNCBs during the EWGs.

A.1.1.1.15 All PVAs were run density independently which is in line with best practice (Parker *et al*., 2022; NatureScot, 2023), and therefore, the counterfactual of growth rate (CGR) is a more useful metric than counterfactual of population size (CPS).

B.3.1 Northern gannet from Grassholm SPA – with 70% macro-avoidance during the non-breeding season

A.1.1.1.16 Four scenarios were modelled within the PVA for northern gannet from Grassholm SPA, considering the lowest and highest advised scenarios of 60-80% displacement and 1-10% mortality plus collisions in line with NRW (A) advice during the EWGs (scenario A & D), the Applicant's HRA approach (70% displacement and 1% mortality plus collisions) (scenario B), and assuming 80% displacement and 1% mortality (scenario C).

Table 1-162: Summary of the annual in-combination impacts used in the PVA for northern gannet from Grassholm SPA.

Scenario	Predicted adult mortalities	Increase in baseline mortality (%)	Decrease in survival rate
A: 60% displacement and 1% mortality plus predicted collisions	68.58	1.18%	0.000952195
B: 70% displacement and 1% mortality plus predicted collisions	70.71	1.21%	0.000981821
C: 80% displacement and 1% mortality plus predicted collisions	72.85	1.25%	0.001011446
D: 80% displacement and 10% mortality plus predicted collisions	226.47	3.88%	0.003144469

A.1.1.1.17 The PVA resulted in a predicted impact, which indicates that median growth rate (and 95% confidence intervals) continues to be >1 and, therefore indicates that the population is predicted to increase in size under these modelled parameters (Table 1-163). The CGR also indicates the impact scenario is close to the baseline or the non-impacted predicted growth rate (between 0.1%- 0.4% difference).

Table 1-163: PVA outputs for northern gannet from Grassholm SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2015	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	86,267	1.76	1.018	0.905	1.083		
	Scenario A	86,181	1.64	1.016	0.903	1.083	0.999	0.999
	Scenario B	86,103	1.61	1.016	0.902	1.083	0.999	0.999
	Scenario C	86,268	1.58	1.016	0.904	1.083	0.999	0.999
	Scenario D	86,047	1.34	1.013	0.903	1.081	0.996	0.997
2065	Baseline	130,687	54.89	1.012	1.001	1.023		
	Scenario A	125,663	48.77	1.011	1.000	1.022	0.960	0.999
	Scenario B	125,520	48.02	1.011	1.000	1.022	0.958	0.999
	Scenario C	125,339	48.21	1.011	1.000	1.021	0.957	0.999
	Scenario D	114,506	35.33	1.008	0.997	1.019	0.875	0.996

1.7.1.1 As the results of the PVA undertaken for northern gannet from Grassholm SPA indicate an increasing population size with and without the predicted impacts, it can be concluded beyond reasonable scientific doubt, that there is no AEoSI when considering the Mona Offshore Wind Project in-combination with other plans and projects. In reaching this conclusion, the Applicant has considered the site's conservation objectives, specifically the requirement for the Grassholm SPA population to remain >30,000 pairs. This conclusion replicates what was previously presented in HRA Stage 2 ISAA Part Three: Special Protection Areas and Ramsar sites Assessments (Document Reference E1.3 F02).

B.3.2 Northern gannet from Grassholm SPA – with 70% macro-avoidance annually

1.7.1.2 Five scenarios were modelled within the PVA for northern gannet from Grassholm SPA, considering the same four scenarios as presented with macro-avoidance during the non-breeding season only.

Table 1-164: Summary of the annual in-combination impacts used in the PVA gannet from Grassholm SPA.

Scenario	Predicted adult mortalities	Increase in baseline mortality (%)	Decrease in survival rate
A: 60% displacement and 1% mortality plus predicted collisions	33.47	0.57%	0.000464730
B: 70% displacement and 1% mortality plus predicted collisions	35.60	0.61%	0.000494356
C: 80% displacement and 1% mortality plus predicted collisions	37.74	0.65%	0.000523981

Scenario	Predicted adult mortalities	Increase in baseline mortality (%)	Decrease in survival rate
D: 80% displacement and 10% mortality plus predicted collisions	191.36	3.28%	0.002657004

1.7.1.3 The PVA resulted in a predicted impact, which indicates that median growth rate continues to be >1 and, therefore indicates that the population is predicted to increase in size under these modelled parameters (Table 1-165). The CGR also indicates the impact scenario is close to the baseline or the non-impacted predicted growth rate (between 0.0%- 0.3% difference).

Table 1-165: PVA outputs for northern gannet from Grassholm SPA.

Year	Impact scenario	Median adult population size	Population change (%) since 2015	Median growth rate	2.5 percentile of growth rate	97.5 percentile of growth rate	Median CPS	Median CGR
2030	Baseline	86,587	2.03%	1.020	0.912	1.085		
	Scenario A	86,576	1.99%	1.020	0.912	1.085	0.999	0.999
	Scenario B	86,602	1.98%	1.020	0.911	1.084	1.000	0.999
	Scenario C	86,508	1.96%	1.020	0.912	1.085	0.999	0.999
	Scenario D	86,389	1.75%	1.018	0.909	1.082	0.997	0.997
2065	Baseline	131,548	55.19%	1.012	1.001	1.023		
	Scenario A	128,927	52.45%	1.012	1.000	1.022	0.980	0.999
	Scenario B	128,786	52.11%	1.012	1.000	1.022	0.979	0.999
	Scenario C	128,692	51.84%	1.012	1.000	1.022	0.978	0.999
	Scenario D	117,501	38.60%	1.009	0.998	1.019	0.893	0.997

1.7.1.4 As the results of the PVA undertaken for northern gannet from Grassholm SPA indicate an increasing population size with and without the predicted impacts concluded beyond reasonable scientific doubt, that there is no AEoSI, when considering the Mona Offshore Wind Project in-combination with other plans and projects. Through the process of reaching this conclusion, the Applicant has considered the sites conservation objectives, specifically the requirement for the Grassholm SPA population to remain >30,000 pairs). This conclusion replicates what was previously presented in HRA Stage 2 ISAA Part Three: SPAs and Ramsar sites Assessments (Document Reference E1.3 F03).

Appendix A: PVA Inputs

A.1 Black-legged kittiwake

A.1.1 Ailsa Craig SPA

A.1.1.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.1.2 Basic information

This run had reference name “Kittiwake_Incombo_Ailsa Craig”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.1.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.1.4 Population 1

Initial population values: Initial population 980 in 2021

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.1.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.1.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00056368, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00080337, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00242793, se: NA

A.1.1.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.2 Rathlin Island SPA

A.1.2.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.2.2 Basic information

This run had reference name “Kittiwake_Incombo_Rathlin”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.2.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.2.4 Population 1

Initial population values: Initial population 27,534 in 2021

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.2.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.2.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00033776, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00048437, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00147807, se: NA

A.1.2.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.3 Lambay Island SPA

A.1.3.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
```

```
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.3.2 Basic information

This run had reference name “Kittiwake_Incombo_Lambay”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.3.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.3.4 Population 1

Initial population values: Initial population 6,640 in 2015

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.3.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.3.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00079516, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00105407, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00280890, se: NA

A.1.3.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.4 Ireland's Eye SPA

A.1.4.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.4.2 Basic information

This run had reference name “Kittiwake_Incombo_Irelands”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.4.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.4.4 Population 1

Initial population values: Initial population 3,100 in 2015

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.4.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.4.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00066565, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00087115, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00226401, se: NA

A.1.4.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.5 Howth Head Coast SPA

A.1.5.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.5.2 Basic information

This run had reference name “Kittiwake_Incombo_Howth”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.5.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.5.4 Population 1

Initial population values: Initial population 3,586 in 2015

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.5.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.5.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00115571, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00151638, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00396096, se: NA

A.1.5.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.6 Wicklow Head SPA

A.1.6.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.6.2 Basic information

This run had reference name “Kittiwake_Incombo_Wicklow”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.6.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.6.4 Population 1

Initial population values: Initial population 1,348 in 2022

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.6.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.6.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00168256, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00229073, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00641271, se: NA

A.1.6.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.7 Cape Wrath SPA

A.1.7.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.7.2 Basic information

This run had reference name “Kittiwake_Incombo_CapeWrath”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.7.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.7.4 Population 1

Initial population values: Initial population 20,688 in 2000

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.7.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.7.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00052038, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00073376, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00218000, se: NA

A.1.7.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.8 North Colonsay and Western Cliffs SPA

A.1.8.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.8.2 Basic information

This run had reference name “Kittiwake_Incombo_Colonsay”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.8.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.8.4 Population 1

Initial population values: Initial population 11,126 in 2000

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.8.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.8.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00033579, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00048201, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00147309, se: NA

A.1.8.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.1.9 Skomer, Skolholm XXX SPA

A.1.9.1 Set up

The log file was created on: 2025-01-01 16:09:12 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.1.9.2 Basic information

This run had reference name “Kittiwake_Incombo_SSSP”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.1.9.3 Baseline demographic rates

Species chosen to set initial values: Black-Legged Kittiwake.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 4.
Is there an upper constraint on productivity in the model?: Yes, constrained to 2 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.1.9.4 Population 1

Initial population values: Initial population 3,088 in 2022

Productivity rate per pair: mean: 0.619, sd: 0.121

Adult survival rate: mean: 0.854 , sd: 0.077

Immatures survival rates:

Age class 0 to 1 - mean: 0.79 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.854 , sd: 0.077 , DD: NA

Age class 2 to 3 - mean: 0.854 , sd: 0.077, DD: NA

Age class 3 to 4 - mean: 0.854 , sd: 0.077, DD: NA

Age class 4 to 5 - mean: 0.854 , sd: 0.077, DD: NA

A.1.9.5 Impacts

Number of impact scenarios: 3.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.9.6 Impact on Demographic Rates

Scenario A - Name: Collisions_Only

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00340632, se: NA

Scenario B - Name: 30*3 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00376265, se: NA

Scenario C - Name: 70*10 and collisions

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00617783, se: NA

A.1.9.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2 Common guillemot

A.2.1 Ailsa Craig SPA

A.2.1.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.1.2 Basic information

This run had reference name “Guillemot_InCombo_AilsaCraig”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.1.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.1.4 Population 1

Initial population values: Initial population 10,494 in 2013

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.1.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.1.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000862770, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004313850, se: NA

A.2.1.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.2 Canna and Sanday SPA

A.2.2.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.2.2 Basic information

This run had reference name “Guillemot_InCombo_Canna”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.2.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.2.4 Population 1

Initial population values: Initial population 7,826 in 1999

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.2.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.2.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000817062, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004085308, se: NA

A.2.2.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.3 Cape Wrath SPA

A.2.3.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.3.2 Basic information

This run had reference name “Guillemot_InCombo_CapeWrath”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.3.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.3.4 Population 1

Initial population values: Initial population 54,781 in 2000

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.3.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.3.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000848918, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004244591, se: NA

A.2.3.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.4 Flannan Isles SPA

A.2.4.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.4.2 Basic information

This run had reference name “Guillemot_InCombo_Flanna”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.4.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.4.4 Population 1

Initial population values: Initial population 19,614 in 1999

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.4.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.4.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000819348, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004096739, se: NA

A.2.4.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.5 Handa SPA

A.2.5.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.5.2 Basic information

This run had reference name “Guillemot_InCombo_Handa”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.5.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.5.4 Population 1

Initial population values: Initial population 75,986 in 2011

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.5.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.5.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000829561, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004147807, se: NA

A.2.5.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.6 Mingulay and Berneray SPA

A.2.6.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
```

```
## plotly          "plotly"          "4.8.0"
## rmarkdown       "rmarkdown"       "1.10"
## dplyr           "dplyr"           "0.7.6"
## tidyr           "tidyr"           "0.8.1"
```

A.2.6.2 Basic information

This run had reference name “Guillemot_InCombo_Mingulay”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.6.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.6.4 Population 1

Initial population values: Initial population 27,057 in 2009

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.6.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.6.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000819919, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004099593, se: NA

A.2.6.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.7 North Colonsay and Western Cliffs SPA

A.2.7.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.7.2 Basic information

This run had reference name “Guillemot_InCombo_Colonsay”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.

Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.7.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.7.4 Population 1

Initial population values: Initial population 27,000 in 2000

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.7.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.7.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000861379, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004306894, se: NA

A.2.7.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.8 North Rona and Sula Sgeir SPA

A.2.8.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.8.2 Basic information

This run had reference name “Guillemot_InCombo_NRona”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.8.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.8.4 Population 1

Initial population values: Initial population 10,000 in 2012

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.8.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.8.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000821872, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004109358, se: NA

A.2.8.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.9 Rathlin Island SPA

A.2.9.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.9.2 Basic information

This run had reference name “Guillemot_InCombo_Rathlin”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.9.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.9.4 Population 1

Initial population values: Initial population 174,796 in 2011

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.9.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.9.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000862420, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004312101, se: NA

A.2.9.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.10 Shiant Isles SPA

A.2.10.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
```

```
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.10.2 Basic information

This run had reference name “Guillemot_InCombo_Shiant”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.10.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.10.4 Population 1

Initial population values: Initial population 10,296 in 2008

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.10.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.10.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000820228, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004101138, se: NA

A.2.10.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.11 Skomer, Skokholm SPA

A.2.11.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.11.2 Basic information

This run had reference name “Guillemot_InCombo_SSSP”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.11.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.11.4 Population 1

Initial population values: Initial population 43,448 in 2021

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.11.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.11.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.003119519, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.015597594, se: NA

A.2.11.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.12 St Kilda SPA

A.2.12.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.12.2 Basic information

This run had reference name “Guillemot_InCombo_Kilda”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.12.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.12.4 Population 1

Initial population values: Initial population 31,400 in 1999

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.12.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.12.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.000819970, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004099849, se: NA

A.2.12.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.2.13 Sule Skerry and Sule Stack SPA

A.2.13.1 Set up

The log file was created on: 2025-01-04 13:39:49 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.2.13.2 Basic information

This run had reference name “Guillemot_InCombo_Sule Skerry”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.2.13.3 Baseline demographic rates

Species chosen to set initial values: Guillemot.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 6.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.2.13.4 Population 1

Initial population values: Initial population 15,266 in 1998

Productivity rate per pair: mean: 0.583 , sd: 0.075

Adult survival rate: mean: 0.94 , sd: 0.025

Immatures survival rates:

Age class 0 to 1 - mean: 0.56 , sd: 0.058 , DD: NA

Age class 1 to 2 - mean: 0.792 , sd: 0.152 , DD: NA

Age class 2 to 3 - mean: 0.917 , sd: 0.098 , DD: NA

Age class 3 to 4 - mean: 0.938 , sd: 0.107 , DD: NA

Age class 4 to 5 - mean: 0.94 , sd: 0.025 , DD: NA

Age class 5 to 6 - mean: 0.94 , sd: 0.025 , DD: NA

A.2.13.5 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.13.6 Impact on Demographic Rates

Scenario A - Name: 70*2

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.004895919, se: NA

Scenario B - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.024479594, se: NA

A.2.13.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.3 Northern gannet (with no macroavoidance)

A.3.1 Ailsa Craig SPA

A.3.1.1 Set up

The log file was created on: 2025-01-02 10:05:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.3.1.2 Basic information

This run had reference name “Gannet_Incomb_AilsaCraig”.

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.3.1.3 Baseline demographic rates

Species chosen to set initial values: Northern gannet.

Region type to use for breeding success data: Global.

Available colony-specific survival rate: National. Sector to use within breeding success region: Global.

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

A.3.1.4 Population 1

Initial population values: Initial population 66,452 in 2015

Productivity rate per pair: mean: 0.766 , sd: 0.051

Adult survival rate: mean: 0.919 , sd: 0.042

Immatures survival rates:

Age class 0 to 1 - mean: 0.424 , sd: 0.045 , DD: NA

Age class 1 to 2 - mean: 0.829 , sd: 0.026, DD: NA

Age class 2 to 3 - mean: 0.891 , sd: 0.019, DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.019, DD: NA

Age class 4 to 5 - mean: 0.919 , sd: 0.042 , DD: NA

A.3.1.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.3.1.6 Impact on Demographic Rates

Scenario D - Name: 80*10 plus collisions

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00265829, se: NA

A.3.1.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.3.2 Grassholm SPA

A.3.2.1 Set up

The log file was created on: 2025-01-02 10:05:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.3.2.2 Basic information

This run had reference name “Gannet_Incomb_Grassholm”.

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.3.2.3 Baseline demographic rates

Species chosen to set initial values: Northern gannet.

Region type to use for breeding success data: Global.

Available colony-specific survival rate: National. Sector to use within breeding success region: Global.

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

A.3.2.4 Population 1

Initial population values: Initial population 72,022 in 2015

Productivity rate per pair: mean: 0.766 , sd: 0.051

Adult survival rate: mean: 0.919 , sd: 0.042

Immatures survival rates:

Age class 0 to 1 - mean: 0.424 , sd: 0.045 , DD: NA

Age class 1 to 2 - mean: 0.829 , sd: 0.026, DD: NA

Age class 2 to 3 - mean: 0.891 , sd: 0.019, DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.019, DD: NA

Age class 4 to 5 - mean: 0.919 , sd: 0.042 , DD: NA

A.3.2.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.3.2.6 Impact on Demographic Rates

Scenario D - Name: 80*10 plus collisions

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00320414, se: NA

A.3.2.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.3.3 Saltee Islands SPA

A.3.3.1 Set up

The log file was created on: 2025-01-02 10:05:25 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.3.3.2 Basic information

This run had reference name “Gannet_Incomb_Saltee”.

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.3.3.3 Baseline demographic rates

Species chosen to set initial values: Northern gannet.

Region type to use for breeding success data: Global.

Available colony-specific survival rate: National. Sector to use within breeding success region: Global.

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: breeding.adults

Are baseline demographic rates specified separately for immatures?: Yes.

A.3.3.4 Population 1

Initial population values: Initial population 9,444 in 2013

Productivity rate per pair: mean: 0.766 , sd: 0.051

Adult survival rate: mean: 0.919 , sd: 0.042

Immatures survival rates:

Age class 0 to 1 - mean: 0.424 , sd: 0.045 , DD: NA

Age class 1 to 2 - mean: 0.829 , sd: 0.026, DD: NA

Age class 2 to 3 - mean: 0.891 , sd: 0.019, DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.019, DD: NA

Age class 4 to 5 - mean: 0.919 , sd: 0.042 , DD: NA

A.3.3.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.3.3.6 Impact on Demographic Rates

Scenario D - Name: 80*10 plus collisions

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.00098640, se: NA

A.3.3.7 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: breeding.adults

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.4 Manx shearwater

A.4.1 Copeland Islands SPA

A.4.1.1 Set up

The log file was created on: 2024-12-20 13:26:40 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.4.1.2 Basic information

This run had reference name “MX_Incombo_Copeland”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.4.1.3 Baseline demographic rates

Species chosen to set initial values: None.
Region type to use for breeding success data: .
Available colony-specific survival rate: . Sector to use within breeding success region: .
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.4.1.4 Population 1

Initial population values: Initial population 9700 in 2007

Productivity rate per pair: mean: 0.6 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.08

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.08 , DD: NA

A.4.1.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.4.1.6 Impact on Demographic Rates

Scenario A - Name: 70*10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001978072 , se: NA

A.4.1.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.4.2 Glannau Aberdaron SPA

A.4.2.1 Set up

The log file was created on: 2024-12-20 13:26:40 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.4.2.2 Basic information

This run had reference name “MX_Incombo_Aberdaron”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.4.2.3 Baseline demographic rates

Species chosen to set initial values: None.
Region type to use for breeding success data: .
Available colony-specific survival rate: . Sector to use within breeding success region: .
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.4.2.4 Population 1

Initial population values: Initial population 32366 in 2001

Productivity rate per pair: mean: 0.6 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.08

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.08 , DD: NA

A.4.2.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.4.2.6 Impact on Demographic Rates

Scenario A - Name: 70*10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001982032, se: NA

A.4.2.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.4.3 Skomer, Skokholm SPA

A.4.3.1 Set up

The log file was created on: 2024-12-20 13:26:40 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.4.3.2 Basic information

This run had reference name “MX_Incombo_SSSP”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.4.3.3 Baseline demographic rates

Species chosen to set initial values: None.
Region type to use for breeding success data: .
Available colony-specific survival rate: . Sector to use within breeding success region: .
Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.4.3.4 Population 1

Initial population values: Initial population 910,312 in 2018

Productivity rate per pair: mean: 0.6 , sd: 0.066

Adult survival rate: mean: 0.87 , sd: 0.08

Immatures survival rates:

Age class 0 to 1 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 1 to 2 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 2 to 3 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 3 to 4 - mean: 0.87 , sd: 0.08 , DD: NA

Age class 4 to 5 - mean: 0.87 , sd: 0.08 , DD: NA

A.4.3.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.4.3.6 Impact on Demographic Rates

Scenario A - Name: 70*10

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001698985, se: NA

A.4.3.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5 Razorbill

A.5.1 Cape Wrath SPA

A.5.1.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.1.2 Basic information

This run had reference name “Razorbill_InComb_CapeWrath”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.1.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.1.4 Population 1

Initial population values: Initial population 4,180 in 2000

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.1.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.1.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.002126314, se: NA

A.5.1.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5.2 Flannan Isles SPA

A.5.2.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.2.2 Basic information

This run had reference name “Razorbill_InComb_Flannan”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.2.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.2.4 Population 1

Initial population values: Initial population 2,102 in 1998

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.2.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.2.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0018329445, se: NA

A.5.2.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5.3 Handa SPA

A.5.3.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.3.2 Basic information

This run had reference name “Razorbill_InComb_Handa”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.3.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.3.4 Population 1

Initial population values: Initial population 10,330 in 2010

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.3.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.3.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0018977072, se: NA

A.5.3.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5.4 Mingulay and Berneray SPA

A.5.4.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.4.2 Basic information

This run had reference name “Razorbill_InComb_Mingulay”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.4.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.4.4 Population 1

Initial population values: Initial population 20,222 in 2009

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.4.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.4.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0018306886, se: NA

A.5.4.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5.5 Rathlin Island SPA

A.5.5.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.5.2 Basic information

This run had reference name “Razorbill_InComb_Rathlin”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.5.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.5.4 Population 1

Initial population values: Initial population 30,786 in 2011

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.5.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.5.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0018316833, se: NA

A.5.5.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5.6 Shiant Isles SPA

A.5.6.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.6.2 Basic information

This run had reference name “Razorbill_InComb_Shiant”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.6.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.

Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.6.4 Population 1

Initial population values: Initial population 8,496 in 2008

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.6.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.6.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.0018343189, se: NA

A.5.6.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA

A.5.7 Skomer, Skokholm SPA

A.5.7.1 Set up

The log file was created on: 2025-01-02 13:33:31 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##                Package          Version
## popbio         "popbio"         "2.4.4"
## shiny          "shiny"          "1.1.0"
## shinyjs        "shinyjs"        "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT             "DT"             "0.5"
## plotly         "plotly"         "4.8.0"
## rmarkdown      "rmarkdown"      "1.10"
## dplyr          "dplyr"          "0.7.6"
## tidyr          "tidyr"          "0.8.1"
```

A.5.7.2 Basic information

This run had reference name “Razorbill_InComb_SSSP”.
PVA model run type: simplescenarios.
Model to use for environmental stochasticity: betagamma.
Model for density dependence: nodd.
Include demographic stochasticity in model?: Yes.
Number of simulations: 5000.
Random seed: 15.
Years for burn-in: 5.
Case study selected: None.

A.5.7.3 Baseline demographic rates

Species chosen to set initial values: Razorbill.
Region type to use for breeding success data: Global.
Available colony-specific survival rate: National. Sector to use within breeding success region: Global.
Age at first breeding: 5.
Is there an upper constraint on productivity in the model?: Yes, constrained to 1 per pair.
Number of subpopulations: 1.
Are demographic rates applied separately to each subpopulation?: No.
Units for initial population size: breeding.adults
Are baseline demographic rates specified separately for immatures?: Yes.

A.5.7.4 Population 1

Initial population values: Initial population 12,001 in 2013

Productivity rate per pair: mean: 0.532 , sd: 0.084

Adult survival rate: mean: 0.895 , sd: 0.067

Immatures survival rates:

Age class 0 to 1 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 1 to 2 - mean: 0.794 , sd: 0.001 , DD: NA

Age class 2 to 3 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 3 to 4 - mean: 0.895 , sd: 0.067 , DD: NA

Age class 4 to 5 - mean: 0.895 , sd: 0.067 , DD: NA

A.5.7.5 Impacts

Number of impact scenarios: 1.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: No

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.5.7.6 Impact on Demographic Rates

Scenario A - Name: 70*10

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.002953067, se: NA

A.5.7.7 Output:

First year to include in outputs: 2030
Final year to include in outputs: 2065
How should outputs be produced, in terms of ages?: breeding.adults
Target population size to use in calculating impact metrics: NA
Quasi-extinction threshold to use in calculating impact metrics: NA