GREEN VOLT

Technical Appendix 12.8

The Supplementary Ornithological Assessment Report

Offshore EIA Report: Volume 2

Green Volt Offshore Windfarm Ltd.

Supplementary Ornithological Assessment

Green Volt Offshore Wind Farm Offshore Environmental Impact Assessment

APEM

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1. Introduction

Green Volt Offshore Windfarm Limited submitted an application on the 20th January 2023 for consent under Section 36 of the Electricity Act 1989 for the construction and operation of an offshore generating station; the Green Volt Offshore Wind Farm (the Project). The proposed floating offshore wind farm (OWF), and associated transmission assets, is to be located at the decommissioned Ettrick and Blackbird oil and gas field, approximately 80 km east of Peterhead, off the east coast of Scotland. The installed capacity of the proposed generating station would be up to approximately 560 MW comprising of up to 35 wind turbine generators (WTGs) providing renewable electricity to oil and gas platforms in the Outer Moray Firth, with any surplus exported to the national grid.

Following the Marine Directorate – Licensing Operations Team (MD-LOT) review of the Green Volt application, including supporting documents and the consultation comments, MD-LOT requested supplementary information from Green Volt Offshore Windfarm Ltd. The supplementary information was requested in order to provide clarity on a number of queries in relation to assessments on offshore and intertidal ornithology in the EIA Report, with supplementary information to be submitted in relation to the EIA application in line with regulation 21 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and regulation 19 of the Electricity Work (Environmental Impact Assessment) (Scotland) Regulations 2017. The requested supplementary information is directly relevant to enable MD-LOT to reach a reasoned conclusion on the outcome of the impact assessment and determination on any potential significant effects from the Project on the offshore and intertidal ornithology.

Based on the NatureScot's representation, MD-LOT requested via written response (dated 6th June 2023) the following supplementary information should be submitted:

- ***'Collision Risk Modelling**: The collision risk modelling must be updated for gannet using a flight speed of 14.9. Additionally, clarification (including citations and rationale) must be provided regarding the Standard Deviation calculations undertaken for density estimates used in the collision risk modelling.'*
    - NatureScot and MD-LOT both acknowledge that the Green Volt application was submitted prior to NatureScot publishing *Bird Guidance Note 7: Guidance to support Offshore Wind Applications: Marine Ornithology – Advice for assessing collision risk of marine birds* (NatureScot, 2023a). Therefore, the Applicant updated the collision risk modelling, including a full reassessment using parameters from NatureScot's *Bird Guidance Note 7* and requested clarifications, which are provided in **Section 3**.
- ***'Displacement**: The displacement assessment including conclusions must be updated and undertaken in line with NatureScot guidance note 8, including the displacement and mortality rates as advised by NatureScot. The threshold on mortality to consider impacts should be updated to 0.02% from the 1% currently used.'*

- NatureScot and MD-LOT both acknowledge that the Green Volt application was submitted prior to NatureScot publishing *Bird Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of marine birds* (NatureScot, 2023b). Therefore, the Applicant has updated assessments of seabird displacement include rates in line with NatureScot's Bird Guidance Note 8 when considering impacts which are provided in **Section 4.2** and in **Section 6** when undertaking population viability analysis.

- ***'Apportioning**: Apportioning within Annex 2 of the report to inform appropriate assessment should be updated to provide the apportioning for each SPA and any non-SPA colonies. The applicant must provide clarity on apportioning totals used and the year of the data used for the totals, in line with the NatureScot request.'*
    - The Applicant has provided clarification on the apportioning totals used within the Green Volt application, with clear indication of the apportioning of the sub-colonies and year of data for each Special Protection Area (SPA) within **Section 0**.

- ***'In Combination Assessment**: Due to in-combination impacts with Berwick Bank, Nature Scot advised there is likely to be adverse effect on site integrity from Green Volt when considered with this development. It is therefore necessary to consider a derogation case for the relevant SPAs / features.'*
    - NatureScot and MD-LOT both acknowledge that the Green Volt application was being finalised prior to any potential impact levels on seabirds being publicly available on Berwick Bank. Therefore, the Applicant has provided updated in-combination impacts with Berwick Bank, which are provided in **Section 4.2** and within **Section 6** when undertaking population viability analysis. The Applicant has prepared a without prejudice derogation case for the relevant SPAs / features in a separate report **Green Volt Offshore Wind Farm Offshore Ornithology Compensation Measures Report**.

- ***'Population Viability Analysis (PVA)**: The PVA should be re-run to include all predicted impacts for species and designated sites using specific values, rather than generic scenarios. MD-LOT advise that in re-running the PVA, a 0.02 percentage point change in productivity / survival should trigger PVA. The PVA must also include the output of Counterfactual for Population Size within the final assessment in line with the relevant NatureScot guidance. Finally, the PVA must be run for both 25 and 35 years to allow for comparability.'*
    - NatureScot and MD-LOT both acknowledge that the Green Volt application was submitted prior to NatureScot publishing *Bird Guidance Note 11: Guidance to support Offshore Wind Applications: Marine Ornithology – Recommendatations for Seabird Population Viability Analysis (PVA)* (NatureScot, 2020). Therefore, the Applicant has updated PVAs to incorporate all details and thresholds requested and have considered the recommended

metrics from NatureScot's Bird Guidance Note 11 in forming conclusions from PVA outputs in **Section 6**.

This report, therefore, provides all the supplementary information requested by MD-LOT as well as responses to representation from NatureScot, the Royal Society for the Protection of Birds (RSPB) and Natural England in **Section 2**.

2. Consultation and Engagement

Three formal consultation meetings in relation to the Green Volt application, post-submission, on ornithological assessment clarifications have taken place to date. Meetings were held with MD-LOT and NatureScot on the 27th and 28th June 2023 and with the RSPB on the 17th July 2023. The purpose of these meetings was to discuss their representations in relation to offshore and intertidal ornithology.

Points of clarification arising from the consultation responses received are provided in **Table 1.** The Applicant's responses to the clarifications raised and where these points are addressed in this report or in the application documents submitted within the EIA Report or Report to Inform Appropriate Assessment (RIAA) are provided in **Table 1**.

Table 1. Post-submission consultation comments and responses.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
NatureScot 06/06/2023			
1	We note that guillemot and razorbill connectivity was updated to include East Caithness Cliffs SPA, North Caithness Cliffs SPA and Copinsay SPA (for guillemot) during the breeding season, based on directional data from Digital Aerial Surveys (DAS) data and tracking data. We welcome the applicant's consideration of this given the novelty around INTOG sites and considering developments further offshore.	The Applicant welcomes NatureScot's agreement with the methods taken for this element of the impact assessment.	No further action required.
2	Gannet is not a named assemblage feature for Troup, Pennan and Lion's Head SPA, it is a notified feature of Gamrie and Pennan Coast SSSI. Therefore, we advise gannet should just be considered through the EIA.	Due to the most recent gannet colony counts at this SPA being significantly higher than at the point of citation for the SPA, the Applicant provided for an assessment on a precautionary basis in the event that any changes to its status change in the citation or if requested for further information. We welcome NatureScot's opinion on this matter that such an assessment was not needed but hope it may be useful for future assessments if required at a later date.	NatureScot noted the approach taken by Green Volt, but noted it was not required as gannet is not a qualifying feature of this SPA. The Applicant has included the Project alone impacts on a precautionary basis for in inclusion of future assessment if required.
3	European storm petrel - we are content with the consideration of the different data sources and conclusions reached on this species.	The Applicant welcomes NatureScot's agreement with the conclusions for this element of the impact assessment.	No further action required.
4	We concur with the updated screening after completion of the 24 months of DAS where a number of species were not recorded in any surveys and therefore the SPAs were screened out. These included: • Breeding herring gull (Buchan Ness and Collieston Coast SPA), • Lesser black-backed gull (Forth Island SPA, Ribble and Alt Estuaries SPA, Skomer, Skokholm and the Seas of Pembrokeshire SPA), • European shag (East Caithness Cliffs SPA, Forth Island SPA), and	The Applicant welcomes NatureScot's agreement with the updated screening for the Project.	No further action required.

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	• Arctic skua (Fetlar SPA).		
5	We also agree based on the small number of observations with the conclusions reached on red-throated divers, observed once in June 2020, and great skua in August 2021.	The Applicant welcomes NatureScot's agreement with the conclusions for red-throated diver and great skua.	No further action required.
6	An assessment has been undertaken to consider the impacts on migratory waterbirds. The assessment was conducted based on the WWT (2014) report. Whilst there are aspects of this report we agree on the use of, we have not applied the conclusions on migrating seabirds to any Scottish casework - this report is currently being updated as part of ScotMER but is not yet available. We agree with the conclusions reached for all non-seabird migratory species that there will be no adverse effect on site integrity to any species from any SPA / Ramsar site.	The Applicant welcomes NatureScot's agreement with the conclusions made on non-seabird migratory species and that no further assessments are required for these species or migrating seabirds.	No further action required.
7	For some instances (items listed below) within the application where approaches have deviated from our guidance, this was agreed as part of pre application stakeholder discussion and agreement. However, in other aspects, there has been deviation from our guidance or previously accepted casework practices for Scottish offshore wind proposals.	The Applicant notes that the consultation responses (as listed below) to the Project's Section 36 and Marine Licence application contain recommendations to follow NatureScot's recently published guidance with their 'Advice on marine renewables development – marine ornithology'. The Applicant wishes to clarify that the guidance notes were made publicly available on the day they were presented by NatureScot at the 2023 ScotMER virtual conference on 1st February 2023. However, the Project application was submitted on 20th January 2023 to MS-LOT (now MD-LOT) before the guidance notes became available, hence why they weren't considered within the Project's Application.	Where available, any advice provided ahead of guidance being published was incorporated within the Project's offshore ornithology assessments presented within **EIA Chapter 12: Offshore and Intertidal Ornithology** and RIAA. The Applicant has in agreement with NatureScot undertaken reassessments of impacts in line with their recently published advice for CRM (see item 16) and threshold calculations for undertaking PVA (see item 11).
	Population Viability Analysis		
8	Not all predicted impacts for species and designated sites have been run through PVA, and we have been uncertain at times in the assessment of being able to follow the sequence and/or some of the values used, as they differ across different parts of	The Applicant ran PVAs for all species within the EIA chapter and RIAA assessments where the predicted impact was estimated to lead to an increase in baseline mortality exceeding 1% for the area of interest whether for the project alone or	To ensure clarity of the impact values that have been presented in the RIAA, tables are provided for all sites and features considered for assessment. To include all project alone impacts values using both

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	the assessment. We are concerned about the transparency of the approach and therefore the overall findings.	cumulatively / in-combination. The criteria for PVA and each species considered for further assessment are defined in **Section 1.3 of Appendix 12.6 Offshore Ornithology: Population Viability Analysis** and **Section 1.2 of Annex 1: Offshore Ornithology Population Viability Analysis (PVA) for HRA**, for the respective assessments. The threshold of 1% increase in baseline mortality is considered best practice for the rest of the United Kingdom (rUK) OWF EIAs and was relied upon due to the absence of guidance on the matter from NatureScot at the time of drafting. An exception to this approach was applied within the RIAA. PVA was not run when the contribution to the in-combination effect from the Project was considered to be exiguous (*de minimis*) level of effect as clearly indicated within the RIAA assessment conclusions.	the Applicant's approach and the SNCB's approach. Presentation of all impact values gives transparency and permits *de minimis* contribution from the Project to be determined when considering in-combination effects. Tables providing impact values to sites and features when considered in-combination with other projects are presented for all sites and features which NatureScot have concluded an AEoSI for Berwick Bank (either alone or in combination), and sites and features where the contribution from the Project to the in-combination effect would be tangible and not considered *de minimis*. These Tables are presented in **Section 5** of the Report.
9	An approach with generic scenarios has been used in the approach to PVA, rather than using specific values.	The Applicant's approach to PVA did not use specific values, as it is considered more beneficial to model a range of values, particularly in circumstances where there may be uncertainty within a single value and to allow future proofing of assessment conclusions should a change in the in-combination totals occur, either due to new developments emerging or a change in guidance.	In agreement with the advice from NatureScot, specific values, as presented in the Tables in **Section 5** of this Report, have been used in undertaking PVA for all sites and features that require assessment. All PVAs undertaken are presented in **Section 6** of this Report and project specific counterfactual outputs are provided. Full transparency is provided (see **Section 5** of the Report) for the derived impact values on an annual basis for all sites and features to be considered with clear signposting to relevant sections of the RIAA and Annexes where necessary.
10	The applicant has only undertaken a few SPA level PVAs and for generic level of impact, not the estimated project alone or in combination impacts. Therefore, they do not provide any project specific counterfactuals, to enable us to assess and provide any advice.	The number of additional mortalities taken through to PVA for both the Applicant's and SNCB's approach are provided in each relevant section; e.g., Para. 641 'Guillemot displacement PVA results' in the Green Volt Offshore Windfarm Report to Inform Appropriate Assessment. The outputs from the PVA can also be viewed in **Annex 1 Offshore Ornithology Population Viability Analysis for HRA** and in this example on p13; **Table B** and **Figure 1**. The Applicant's approach to PVA allows for consideration of both the Applicant's and SNCB's predicted impact levels and any future changes to the in-combination	

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		totals as projects change through the pre-application and post-application process. In the absence of guidance from NatureScot on an appropriate method to run PVAs, the Applicant followed best practice considered in other recent rUK OWF applications that followed the same principles.	
11	The applicant has used a 1% threshold on mortality to consider impacts. Our advice is to use 0.02 percentage point change in mortality as a threshold for undertaking PVAs, which can generate counterfactuals for population growth rate and population size, which we would use to draw conclusions on population level impacts.	The Applicant consulted on the ornithology assessment methods and level of impacts throughout the pre-application phase, but the advice provided by NatureScot that a 0.02 percentage point change in survival should be the threshold for further assessment through PVA was not advised. The only advice received by the Applicant on the use of PVA was from the RSPB, who advocated the use of the Natural England PVA tool (Mobbs et al., 2020) in their Scoping Opinion response (27th January 2022). The RSPB advised that: *'Where apportioned impacts are large and / or the SPA populations are small, it is likely that population models will be required to establish whether or not there could be long-term impacts on population viability'*. The approach taken by the Applicant; an increase of 1% or more in the baseline mortality rate, is the criteria that has been used in both recently consented rUK projects and other recently submitted applications, including Berwick Bank OWF and Pentland Floating OWF, which were also submitted before the NatureScot guidance was published.	The Applicant agreed to revise assessments and provide updated outputs following NatureScot's new guidance.to use percentage point change in survival with a 0.02 threshold for undertaking PVA. This metric is now provided alongside an increase of 1% or more in the baseline mortality rate metric for comparison.
12	The applicant has not relied on the outputs of the Counterfactual for Population Size. Although these are presented, they are not used in their final assessment, instead relying solely on the Counterfactual Growth Rate. This is contrary to our guidance.	The Applicant notes NatureScot's most recent guidance, which was not available at the time of undertaking assessments for this Project. Ahead of the Project's application NatureScot did not request the Applicant to make use of or incorporate particular PVA metrics in forming final conclusions. The Counterfactual of Population Size can be misunderstood as a single metric when used for assessment purposes and can be difficult to interpret when assessing the significance of potential impacts. Therefore, the Applicant presented the metric, but the assessments prioritised the counterfactual of growth rate as the metric for inferring population level consequences. The reason for making use of the counterfactual of growth rate, is due to it being less impacted by density independence in the model over time	The details for all PVAs are included in the PVA annexes to both the ES and RIAA. All information (including counterfactual of population size) relating to PVA outputs is available in the application and clearly signposted within this report to relevant sections of these annexes. Conclusions reached for PVAs within this report follow advice provided within the NatureScot Guidance Note 11.

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		(following recommendations in Jitlal *et al.,* 2017), and thresholds for determining impacts can be set in reference to the status or trend of the population. This is fully described in Section 2.3 Impact Values Assessed in **Annex 1 Offshore Ornithology Population Viability Analysis for HRA**.	
13	The PVA models have been run for 35 years. We advise that the results of the PVA should be run for both 25 years and 35 years to aid comparability with other offshore wind projects as well as to reflect the proposed operational period.	The Applicant ran the PVA to reflect the expected operational life of the Project, for 35 years, which is in line with the approaches taken by other consented and submitted projects in the UK. Ahead of the Project's application, NatureScot did not request the Applicant to run the PVA for any specific time periods, whilst the current NatureScot guidance note 11 'Marine Ornithology - Recommendations for Seabird Population Viability Analysis (PVA)' was not available to the Applicant when running the PVA's for the Project.	The Applicant has presented Tables comparing PVA outputs from both 25 and 35 year runs, these are provided in **Section 5** of the Report.
	In-combination assessment		
14	The applicant has stated that the in-combination assessment was completed prior to the submission of the Berwick Bank application, therefore Berwick Bank has not been included in the assessment, yet Berwick Bank has been in the public domain and the scoping opinion issued prior to the Green Volt application being submitted. We have recently objected to the Berwick Bank application due to adverse effects on site integrity (AEoSI) to multiple seabird species within the UK European Site Network, some of which overlap with the species and sites assessed in this application. We therefore advise that for this application, it is likely that, in combination with Berwick Bank, any of the SPAs / species where we have concluded AEoSI for Berwick Bank (either alone or in combination) and where there is likely to be any additional impact from Green Volt, we will also be considering a conclusion of AEoSI in combination for Green Volt.	The Berwick Bank Application was submitted on the 9th December 2022, whilst the Project's (Green Volt) was consequently submitted on the 20th January 2023. Though it may be that the Berwick Bank assessments were published ahead of the Green Volt application they were published after the agreed NatureScot, cut-off time to include projects within in-combination assessments, which for clarity was agreed as three months prior to the Project's submission date. This meant no other project information published after 1st November 2022 was required to be included.	The Applicant has agreed to include additional impacts to sites and features from Berwick Bank OWF in the assessment of in-combination effects for the Project. The revised impact values are presented in the Tables within **Section 5** of the Report.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
15	We are unable to reach any definitive conclusions to provide our advice on in-combination effects, as the Green Volt RIAA (Table 7.69, page 240) has concluded for numerous species and SPAs that "assessment alone concluded potential for a trivial and inconsequential level of effect, that would be well within the error margins of the assessment, and therefore no potential for any contribution for an in-combination effect. Furthermore, there is no proposed overlap with other projects where data is available within a reasonable distance based on expert judgement that would result in a possible in-combination impact".	The Applicant acknowledges that where the assessment for the Project alone concluded potential for an inconsequential level of effect such levels were considered to have no potential for any meaningful contribution to an in-combination effect. The Applicant also acknowledges that Table 7.69 on page 240 presents the conclusions for the in-combination assessment, but it should be noted that the latter sentence relates to assessments during the installation (construction) and decommissioning phases only. Furthermore, at the time of the application there was no overlap with other proposed or consented projects (other than Berwick Bank) within a reasonable distance, based on expert judgement, that would result in a potential in-combination impact during installation (construction) or decommissioning phases.	On the understanding that the comment raised refers to conclusions reached during the construction phase it was agreed no further action required. See responses to item no. 18.
	Collision risk modelling		
16	While many of the input parameters used for the collision risk modelling are those identified within our guidance, we advise the following deviations: - Gannet flight speed – the applicant uses 13.33 and we advise 14.9.	The Applicant notes NatureScot's most recent guidance, which was not available at the time of undertaking assessments for this Project. Ahead of the Project's application the Applicant consulted on proposed collision risk modelling input parameters with NatureScot. This included issuing a detailed method statement note on the planned parameters which were to be used for each species for collision risk modelling for the Project (in Table 8 within the Method Statement document issued to	Gannet assessments within the Report would be undertaken and presented using both the Applicant's and NatureScot's approach to account for the different flight speed requested. Revised CRM for gannet are presented in **Section 3** of the Report.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
		NatureScot in March 2022 following presentation of the entire document to them). Following further consultation meetings between the Applicant and NatureScot no deviations from the planned parameters included within the method statement were requested ahead of the Project's application. In response to the comment on gannet flight speed that Applicant notes that NatureScot's recommendation is from Pennycuick (1987), which is based on 32 cliff-based observations using an ornithodolite (Pennycuick, 1982) over a period of 12 days on the island of Foula. The instrument used is for flight speed estimates at short ranges of up to 295 m (Pennycuick, 1983) and with a position error of about 2.6 m at 100 m and 8 m at maximum range. The precision of the instrument was described, in the words of the author, as 'not very high' (Pennycuick, 1982). A more recent study (Skov *et al.*, 2018) used laser rangefinder tracking data to estimate flight speed both inside and outside the Thanet OWF from 706 tracks over a period of approximately two years. The Applicant considers such estimates on gannet flight speed to be more accurate and more representative of flight behaviour around offshore wind turbine generators in comparison to Pennycuik's cliff-based observations. The Applicant has therefore relied upon the best available and most up-to-date scientific research on flight speeds to inform assessments.	
17	We have some concerns over Standard Deviation calculations for density estimates used in collision risk modelling. This is not a commonly used method - our understanding is that it uses 25% of the 95% confidence limits. Typically, the 95% confidence limits are 1.96 SD from mean for a normal distribution. However, we noted that range around the mean appeared to be skewed, suggesting it was not equally distributed and therefore we are not sure if this approach was used for reasons related to this. We request clarification from the applicant on this point, including citation and rationale.	The Applicant can confirm that NatureScot's understanding is correct, in that one standard deviation is estimated to be approximately 25% of the 95% confidence limits, in line with the expectation of a normal distribution. The observed distribution will not be a perfect normal distribution and in some cases will show a skewed distribution, and for that reason the report makes it clear that this approach provides only an approximate value for the standard deviation. Given a sufficiently large sample size, it is generally reasonable to approximate the distribution with a normal distribution. The approximate approach is necessary because of the complications of robustly propagating uncertainty through the process of apportioning unidentified birds to species level, given that the approach to apportionment relies on the	The Applicant is to provide a more detailed methodological approach and justification on this method. This is presented in the **Section 3.2** of the Report.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
		abundances of birds identified to species level, and in some cases is required to consider data from wider survey areas and/or alternative time periods. Therefore, the approach given to approximate one standard deviation is considered the best option available. Our approach is explained in detail in Section 2.2.1.4 Density of Birds in Flight in Technical Appendix 12.3 Offshore Ornithology: Collision Risk Modelling.	
18	Displacement is considered during the construction phase at 50% of the constructed rate. This was not agreed or requested as part of the Scoping and has not been undertaken as part of the assessment process to date in Scotland	The Applicant notes NatureScot did not request this to be included in their Scoping Opinion. However, they did not state it was not required in their Scoping Opinion and therefore, the Applicant took a precautionary approach and included it within the application, as there was some uncertainty surrounding whether this was to be undertaken or not. The Applicant now accepts that this information was not needed and, therefore, it can be ignored and discounted as part of the application for this Project.	As stated in the written response from MD-LOT to the Applicant, dated 6th June 2023, clarification was sought from NatureScot as to whether displacement should be considered during the construction phase and if so, at what rate. NatureScot advised the following: "displacement should not be considered at all during the construction phase. Therefore, we cannot provide advice on an appropriate rate which could be used". Agreed that NatureScot to ignore the construction phase assessment as it was not requested in the scoping opinion.
19	NatureScot is aware of much of the literature cited within the RIAA in relation to displacement rates. However, we are currently awaiting a number of key studies (including post-consent monitoring from Scottish windfarms) to be published before we review and update our advice on displacement rates. Therefore, our current advice (as stated in our guidance note 8) should be used within this assessment.	The Applicant notes NatureScot's most recent guidance on displacement, which was not available at the time of undertaking assessments for this Project. Ahead of the Project's application the Applicant consulted on displacement rates and received NatureScot's recommended values for different species and seasons, which are the same as those in NatureScot's Guidance Note 8. However, the EIA process allows for the use of the latest evidence in support of impact assessments being made. Therefore, the Applicant made use of the most extensive review of auk (guillemot and razorbill) and gannet displacement studies in European waters (including post-consent monitoring from Scottish OWFs), undertaken by APEM Ltd (APEM, 2022a and 2022b). In addition, the Applicant provided for both NatureScot's and the Applicant's alternate assessment approach to displacement within the EIA Report and RIAA for the Project, though the Applicant acknowledges the values according to	NatureScot clarified that Green Volt will not need to update their rates and no further action required. Impact values are presented using both the Applicant's and SNCB's displacement rates in **Section 5** of the Report.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
		NatureScot were only provided in the tables and not taken and used through the final assessment conclusions.	
20	The conclusions reached were based on the applicant's displacement and mortality rates, not the rates advised by NatureScot.	The Applicant provided for both NatureScot's and the Applicant's alternate assessment approach to displacement within the EIA Report and RIAA for the Project, though the Applicant acknowledges the values according to NatureScot were only provided in the tables and not taken and used through the final assessment conclusions.	Assessments in the Report would be undertaken and presented using both the Applicant's and NatureScot's approach. Assessments taken through to PVA have based conclusions using both approaches - see **Section 6** of the Report.
21	The applicant has raised concerns over the precaution in combining collision impacts with distributional response impacts. Due to the evidence publicly available we maintain this is currently the best approach for considering species, such as gannet and kittiwake which are susceptible to both impacts. We are aware of work being undertaken by Natural England on this, and once this is publicly available, we will be reviewing our guidance on this aspect.	The Applicant notified NatureScot during the consultation process that an approach to incorporate macro-avoidance for gannet would be presented. The advice provided to the Applicant by NatureScot through consultation, on the 21st Sept 2022 (see EIA Report Chapter 12, Section 12.3.3 Formal Consultation, Table 12.4), was if approaches with macro-avoidance are included in assessments they are to be presented alongside assessments without macro-avoidance. Therefore, following NatureScot's pre-application advice the Applicant incorporated macro-avoidance for the assessment of gannet and presented both approaches as requested; (see EIA Report Chapter 12, Section 12.11.6 for Project alone assessment). The potential level of gannet mortality from the Project alone is 8 individuals for a combined assessment of displacement and collision risk, when applying a macro-avoidance. When assessing following the more precautionary method of not applying a macro-avoidance the potential mortality rate is 23 individuals. When apportioning this combined potential impact to different designated sites (e.g. SPAs) all mortality levels remain at or below a single individual whether incorporating macro-avoidance or not for gannets. This demonstrates that the difference in any SPA level effect, when taking into account either method, remains so small as to be considered exiguous. The only exception is for the Forth Islands SPA, where mortalities are more than a single individual whether incorporating macro-avoidance or not.	Assessments for combined impacts from collision and displacement for gannet in the Report would be presented using NatureScot's approach.

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		However, the EIA process allows for the use of the latest evidence in support of impact assessments being made. Therefore, the Applicant made use of the most extensive review of gannet displacement studies in European waters (including post-consent monitoring from Scottish OWFs), undertaken by APEM Ltd (APEM, 2022b). In addition, the Applicant provided for both NatureScot's and the Applicant's alternate assessment approach to combining collision and displacement within the EIA Report and RIAA for the Project, though it should be noted that other UK SNCBs (including Natural England and Natural Resources Wales) advocate for the use of macro-avoidance in order to reduce the double counting if not applying it.	
22	The apportioning within Annex 2 of the RIAA appears to show a mix of colonies used within the tables (Table 2 vs Appendix 1). Instead, we require to see the apportioning for each SPA and any non-SPA colonies clearly identified. Our understanding of Table 2 is that it indicates the totals for the whole SPAs, with the appendix table suggesting that Seabird Monitoring Programme (SMP) sub-colonies were used and apportioned and then totalled for whole SPAs. Could the applicant confirm if this understanding is correct? We also ask the applicant to confirm the year of the data used for the totals to ensure this is consistent across colonies.	The Applicant followed NatureScot's apportionment guidance at the time of the application, which was to use the SNH (2018) paper to consider how to consider different colonies and apportion the impact approach appropriately. The Applicant understands that this is still the only guidance available for use in Scotland. The Applicant can also confirm that NatureScot's understanding is correct with regards to data for those SPA's considered within the assessments for the Project relying on the SMP database. It should be noted that for a number of SPAs whole colony counts are not available on the SMP, with multiple sub-colony counts required to be considered to build up to the whole colony count. In such instances, the sub-colonies were used in the apportionment process, as is described in the SNH (2018) guidance. Should NatureScot require further levels of detail to be provided with regards to which sub-colonies contribute to which SPA then this can be provided. The Applicant can also confirm that the colony counts used from the SMP database were from the year that was closest to the period for which digital aerial survey data were collected for the Project, though no colony counts were used that post-date the surveys.	Further details would be provided in the Report, to clarify apportionment using the sub-colony data and year of count data. This is provided in **Section 0** of the **Report**.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
	Highly Pathogenic Avian Influenza (HPAI)		
23	A number of seabird species have been significantly affected by HPAI although the full magnitude of impacts has not yet been realised (Philip and Tyler, 2022). This has implications not just for the baseline (reference population) but for the context within which impacts from the wind farm are assessed. Uncertainty remains as to the scale of impact: where and for which species and for how long. This necessitates greater precaution in our assessment, and we will be able to provide further advice on this aspect once we have been able to fully assess the Green Volt application both on its own and in combination with other developments.	The Applicant notes NatureScot's comment on HPAI and awaits further updates as to what may be considered as the implications for any species or designated sites affected by it. However, it should be noted that as the digital aerial survey data for the Project were collected prior to the spread of HPAI in Scottish seabirds the assessments remain valid, as comparisons are made between a baseline for the Project with colony and population estimates that both pre-date the epidemic. HPAI was also considered within the Project's application, including **EIA Report Chapter 12.11.6 Future Baseline Offshore**.	No further action required.
	Entanglement		
24	We consider the key entanglement issue for birds is primarily if ghost fishing gear get snagged with mooring lines. However, we are unable to quantify this without knowing the likely depths at which ghost fishing may become entangled and whether this overlaps with any birds foraging in the area. We request that further information is presented around this aspect and what mitigation may be undertaken to identify: • If ghost gear entanglement does occur • The actions that will be taken to remove any ghost fishing gear.	The Applicant welcomes NatureScot's agreement that it is not possible to quantify this potential impact at present, though it has not been raised as an issue with respect to any oil and gas operations within UK waters that may also be subject to ghost fishing gear getting snagged with their mooring lines. There will be an annual ROV check of mooring lines. If anything is observed hanging from the mooring lines it then will be recovered by ROV. However, the angle of the mooring lines from the bottom of the floating substructures is steep (see **EIA Report Chapter 5 Project Description Figure 5.6** showing the catenary curve) so it is expected that heavy items such as fishing nets would be more likely to slide down to the touchdown point near the seabed. The mooring lines are continually moving so this would encourage downward movement. The Green Volt project team have heard anecdotally from an operational floating offshore wind farm that there is no evidence to date of fishing net entanglement occurring with their catenary mooring lines.	No further action required.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
	Cable Corridor		
25	One cable corridor option (North Connect Parallel) makes landfall within Buchan Ness to Collieston Coast SPA. Page 29 of the RIAA outlines that the detailed evaluation of landfall locations is to be presented within the Onshore EIA report. This will require assessment of any impacts on SPA to be included. However, we note that in section 7.1.1.1 para 286 that work at the seaward HDD emergence will not be undertaken during the breeding season to avoid disturbance to breeding seabirds within Buchan Ness to Collieston Coast SPA. As this is below MHWS, this should be conditioned so as to avoid disturbance during the breeding seasons.	The Applicant is committed to work at the seaward HDD emergence not being undertaken during the breeding season in order to avoid disturbance to breeding seabirds within Buchan Ness to Collieston Coast SPA. This condition is stated as part of Project's embedded mitigation measures; see **EIA Report Chapter 12 Table 12.10, item 5**.	No further action required.
26	The RIAA concludes no AEoSI due to habitat loss relating to the cable corridor as it is within the consented NorthConnect HVDC Link corridor. This should still have been assessed, with the findings of the North Connect appropriate assessment used to help justify the conclusion being reached.	The Applicant acknowledges NatureScot's request for supplementary information with regards to a potential LSE due to habitat loss relating to the cable corridor. The Applicant provides the following supplementary information from which a conclusion of no AEoSI has been reached: The assessment of anticipated impacts from the consented NorthConnect marine HVDC cable installation is described in **Chapter 17: Ornithology Ecological Impact Assessment of the North Connect EIA** which describes the residual impacts and their significance. The assessment considered disturbance due to displacement from foraging habitat and due to noise and light pollution from the vessels during the cable pull, marine surveys, and cable laying activities. The analysis on vessel numbers revealed that throughout the year the average daily number of vessels using the consenting corridor up to the UK EEZ is consistently over 50 per day. Fewer vessels will be closer to shore, though there is a high density of vessels using the area close by the cliffs; predominantly fishing vessels but also recreational vessels and oil and gas vessels. Therefore, birds will have some degree of habituation to vessels coming in close to the cliffs and along the cable corridor. The numbers of birds recorded on the surrounding cliffs to the cable pull activity are low (less than 3% for all species at the Buchan Ness to	No further action required.

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		Collieston Coast SPA). Given the distance from the HDD exit and the nearest seabird nest sites are over 200m, it is highly unlikely that noise disturbance in the context of the existing environment would cause nest disturbance. The assessment concluded the effects as having a negligible magnitude and a minor, non-significant effect in EIA terms. This would be particularly so for the Green Volt Project with the HDD exit point being positioned further out from land at 500 to 700 m and to be undertaken outside of the breeding season.	
RSPB			
	Overview		
27	The RSPB has a number of methodological concerns with the manner in which the assessment has been carried out. These will result in an underestimation of the scale of impact and include: • Inadequate consideration of potential impacts on European Storm petrels. • The incorrect use of Population Viability Analysis output metrics in assessment of significance of impact. • The lack of a Population Viability Analysis for gannet and kittiwake for combined mortalities arising from collision and distributional change. • The lack of inclusion of Berwick Bank offshore wind farm in the cumulative assessment. As a result of these concerns, the RSPB is unable to reach conclusion of the significance of impacts in combination with other projects for the following species SPA populations: • Buchan Ness and Colliston Coast SPA guillemot populations. • Troup, Pennan and Lion's Head SPA gannet and guillemot populations. • North Caithness Cliffs SPA guillemot population Forth Islands SPA gannet population.	The Applicant notes the RSPB's comments regarding methodological concerns for certain assessments. The Applicant's responses are provided in detail for each issue raised below.	No further action required

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	• Hermaness, Saxa Vord and Valla Field SPA gannet population. • Mousa SPA European storm petrel population. • Sule Skerry and Sule Stack SPA European storm petrel population Despite our methodological concerns, in a number of cases the predicted impacts are so severe that the RSPB is able to conclude that there will be significant Adverse Effects on Site Integrity on the following SPA species populations arising out of mortality from the Green Volt wind farm, in-combination with other projects: • Buchan Ness and Colliston Coast SPA kittiwake population. • East Caithness Cliffs SPA kittiwake and guillemot populations. • Troup, Pennan and Lion's Head SPA kittiwake population.		
	Methodological concerns		
28	Our concerns around the impacts on European storm-petrels are twofold; the potential inadequacy of the survey method to detect birds, and the lack of consideration of attraction to lights and consequent disorientation. European Storm-petrels depart from and return to the colony at night and will forage both diurnally and nocturnally (D'Elbee and Hemery, 1997, Bolton, 2021). However, the times when the digital aerial surveys were carried out are highly constrained and it is therefore very likely that key activity periods have been missed and so an incorrect usage of the site by storm petrels was recorded. Furthermore, as has been highlighted in a recent review, (Deakin et al., 2022), it is unclear whether morphologically similar species such as European and Wilson's Storm-petrel can be successfully identified to species level by digital aerial survey. The attraction of Procellariformes to light is well recorded, for example observers in both the UK and Canada have reported that hundreds, or even thousands, of seabirds, predominantly species of storm-petrel, have been killed by attraction to the gas flares of hydrocarbon platforms. Wind farms are required to be illuminated in accordance with marine navigation regulations	The Applicant provided a detailed assessment of the predicted abundance and occurrence of storm petrel over the Project area and gave consideration to the potential effects from artificial light in the **EIA Report Chapter 12, Section 12.8.2**. The predicted abundance of storm petrel derived from the Project specific surveys were as would be expected given all current evidence from distribution usage models published by Waggit *et al*. (2019) and Bolton *et al*. (2020). While storm petrels are known to be active nocturnally their activity was shown to be closer to colonies and not in the vicinity of the Project area from the study of Bolton et al. (2021). It is therefore unlikely that surveys missed key active periods and that the usage of the Project area by storm petrels is significantly higher than predicted. The RSPB cite evidence presented in a recent review by Deakin et al. (2023) published in December 2022, on storm petrel attraction to artificial light for inadequate consideration of potential impacts. The Applicant reviewed all available literature at the time of writing the EIA Report including publications cited in the Deakin *et al*. (2023) review. The Applicant notes that evidence cited by the RSPB for inadequate assessment to lighting	Further consideration into impacts on European storm-petrel are provided in **Appendix 2** .

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	and as such, it seems very likely that storm-petrels will be attracted to these lights (Deakin et al., 2022). Furthermore, once attracted, there is evidence that storm-petrels will become disoriented. Such evidence includes: the grounding of fledgling European Storm-petrels in lit areas of the village on Hirta, St Kilda (Miles et al., 2010) and the grounding of European Storm-petrels onto rocks lit by researchers' head torches (Albores-Barajas et al., 2011). Once attracted to the vicinity (i.e., within several tens of metres) of a light source, birds seem unable to escape and become vulnerable to collision. Light-induced disorientation may cause birds to circle light sources for many hours (Gauthreaux and Belser, 2006) with obvious implications for collision risk, as birds both spend longer in the proximity of turbines and there being a larger number of occasions when an individual bird may pass through the rotor-swept area.	impacts are from behaviours observed in proximity to the colony or gas flares. This type of evidence cannot be translated with any certainty to at-sea behaviour to turbine lighting and will also suffer from reporting bias of an observed effect. The Applicant considers that due consideration has been given to the current evidence and together with the species observed low flight height behaviour the risk of collision to turbines from light attraction is low.	

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29	The incorrect use of Population Viability Analysis output metrics in assessment of significance of impact: While there are two PVA output metrics presented in Annex 1 of the Report to Inform the Appropriate Assessment, the Counterfactual of Population Size (CPS) and the Counterfactual of Population Growth Rate (CPGR), on CPGR is used in the assessment of the significance of impacts. This is contrary to a specific recommendation of a review of output metrics, following work by the RSPB (Green et al., 2016), commissioned by the Joint Nature Conservation Committee (JNCC) and carried out by the British Trust for Ornithology (BTO) (Cook et al. 2016). That review recommended the ratio of growth rates are presented to quantify the consequence of impacts at a population level and the ratio of population sizes to present these impacts in an easily understandable context. A further review was commissioned by Marine Scotland Science and carried out by the Centre for Ecology and Hydrology (Jitlal et al. 2017), and the conclusions as to utility of output metrics was similar. As we argued previously, the ease of understanding of the CPS is crucial to its utility; the numbers given by the CPGR are less understandable outwith a population modelling context. To use the theoretical example quoted by the BTO, a CPS of 0.515 means the population size of a breeding colony is expected to be 51.5% (i.e., half) of what it would have been in the absence of the development after 25 years, which is easy to understand. Whereas the corresponding CPGR, 0.973, means that the annual population growth rate at the breeding colony declines from 0.994 to 0.967. The actual scale of the consequence of this is hard for a non-specialist to comprehend, that of the CPS is not. This issue of comprehension is crucial in reducing uncertainty, as lack of clarity in presenting results acts to increase uncertainty, and the consequent need for precaution (Masden et al., 201510, Seale et al., 202111, 202312. The Applicant is incorrect in disassociating the two metrics, arguing that this is necessary because of the use of density independent formulations. However, the two metrics are very	The Applicant provides both Counterfactual of Population Size (CPS) and CPGR PVA metrics but prioritises the Counterfactual of Population Growth Rate (CPGR) metric in forming final conclusions. The CPS can be misunderstood as a single metric when used for assessment purposes as the scale of this metric can be considerably large with increasing time which can be misleading when assessing the significance of potential impacts. Therefore, the Applicant presented the metric, but the assessments prioritise the counterfactual of growth rate as the metric for inferring population level consequences. The reason for making use of the counterfactual of growth rate, is due to it being less impacted by density independence in the model over time (following recommendations in Jitlal et al., 2017), and thresholds for determining impacts can be set in reference to the status or trend of the population. This is fully described in **Section 2.3 Impact Values Assessed in Annex 1 Offshore Ornithology Population Viability Analysis for HRA**.	No further action required

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	similar, the only key difference is that CPGR does not include the length of time that the wind farm will be operational. They are both outputs of the same modelling process and will therefore both be equally affected if density dependence is included or not in the formulation. The only difference is that because CPGR is a smaller number, the relative change between density independent and density dependent formulations will appear to be small. The consequent change to the impacted population will be identical with both metrics. The importance of including both metrics was acknowledged by the Secretary of State for Business, Energy & Industrial Strategy of the UK Government in a letter to the Applicants for Hornsea Project 4, explicitly asking for both metrics to be provided by the Applicant (BEIS, 2022).		
30	The lack of a Population Viability Analysis for gannet and kittiwake for combined mortalities arising from collision and distributional change: The Applicant has, correctly, presented the result of mortalities arising from distributional change and collision combined for kittiwake and gannet, but has not then used these for the subsequent population analysis, for the populations of affected SPAs. This prevent a full assessment being carried out and results in an inability to reach conclusions of significance for these species.	The applicant raised concerns over the precaution in combining collision impacts with distributional response impacts during the pre-application consultation stage. An agreement could not be reached concerning incorporating macro-avoidance when considering the combined impacts from displacement and collision. Nevertheless, the additional mortalities predicted from displacement for kittiwake were less than 1 bird for all sites and a maximum of 1.4 birds for gannet regardless of rates used in the assessment. Therefore, for the reasons stated collision impact only was assessed in-combination as the addition of less than 1 bird would be inconsequential to a combined assessment.	No further action required
31	The lack of inclusion of Berwick Bank offshore wind farm in the cumulative assessment:	The Berwick Bank Application was submitted on the 9th December 2022, whilst the Project's (Green Volt) was consequently submitted on the 20th January 2023. Though it	No further action required

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	An Application for Consent under Section 36 of the Electricity Act 1989 (as amended), Marine Licenses under part 4 of the Marine (Scotland) Act 20120 and Marine and Coastal Access Act 2009 to construct and operate Berwick Bank Offshore Windfarm, off the coast of East Lothian and the Scottish Borders was submitted on 19/01/2023. This application predicts significant impacts on a number of seabird species, both arising through the project alone and in-combination. The scale of impact means that any subsequent application, such as Green Volt, will need to consider these impacts in their cumulative assessment. This has not been done, and it means that RSPB Scotland is unable to reach conclusion of the significance of impacts in combination with other projects for the following species SPA populations: • Buchan Ness and Colliston Coast SPA guillemot populations • Troup, Pennan and Lion's Head SPA gannet and guillemot populations • North Caithness Cliffs SPA guillemot population • Forth Islands SPA gannet population • Hermaness, Saxa Vord and Valla Field SPA gannet population • Mousa SPA European storm petrel population • Sule Skerry and Sule Stack SPA European storm petrel population.	may be that the Berwick Bank assessments were published ahead of the Green Volt application they were too late to include in the final in-combination assessments, which were completed ahead of that date and going through the technical and legal review process in December 2022. The Applicant had agreed, ahead of the application, that the cut-off time to include projects within in-combination assessments was set at three months prior to the Project's submission date, which would mean no projects after 1st November 2022 were required to be included.	
	Scale of impact As detailed above, RSPB Scotland has a number of methodological concerns with the Assessment, that have meant we are, in a number of cases the predicted impacts are so severe that the RSPB is able to conclude that there will be significant Adverse Effect on Site Integrity (AEoSI) on the following SPA species populations arising out of mortality from the Green Volt wind farm, in-combination with other projects. These are detailed below:		

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
32	Kittiwake: Using the methods advocated by NatureScot, Marine Scotland Science and the RSPB during scoping, the impacts arising from collision mortality associated with Green Volt Offshore Wind Farm in combination with other projects, not including Berwick Bank Offshore Wind Farm, are predicted to result in the annual population growth rate of kittiwake at the Buchan Ness and Colliston Coast SPA declining, with a ratio of impacted to unimpacted population growth rate of 0.996. This means that after the 35-year lifetime of Green Volt Offshore Wind Farm, the population size of the SPA is expected to be 89.5% of what it would have been in the absence of the development. As such, RSPB Scotland consider potential AEoSI cannot be ruled out for kittiwake at the Buchan Ness and Colliston Coast SPA.	The Applicant acknowledges that in-combination collision mortality for kittiwake at the Buchan Ness and Colliston Coast SPA has the potential for an AEoSI. However, the contribution from the Green Volt project to the collision mortality in combination with other projects is predicted to be a maximum of 1.1 birds using the SNCB's approach and less than 1 bird using the Applicant's approach. The Applicant considers the contribution from the Green Volt Project to the in-combination impact to be intangible.	No further action required
33	Using the methods advocated by NatureScot, Marine Scotland Science and the RSPB during scoping, the impacts arising from collision mortality associated with Green Volt Offshore Wind Farm in combination with other projects, not including Berwick Bank Offshore Wind Farm, are predicted to result in the annual population growth rate of kittiwake at the Troup, Pennan and Lion's Head SPA declining, with a ratio of impacted to unimpacted population growth rate of 0.996. This means that after the 35-year lifetime of Green Volt Offshore Wind Farm, the population size of the SPA is expected to be 87.2% of what it would have been in the absence of the development. As such, RSPB Scotland consider potential AEoSI cannot be ruled out for kittiwake at the Troup, Pennan and Lion's Head SPA	The Applicant acknowledges that in-combination collision mortality for kittiwake at the Troup, Pennan and Lion's Head SPA has the potential for an AEoSI. However, the contribution from the Green Volt project to the collision mortality in combination with other projects is predicted to be less than 1 bird using both the SNCB's approach and the Applicant's approach. The Applicant considers the contribution from the Green Volt Project to the in-combination impact to be intangible.	No further action required
34	Using the methods advocated by NatureScot, Marine Scotland Science and the RSPB during scoping, the impacts arising from collision mortality associated with Green Volt Offshore Wind Farm in combination with other projects, not including Berwick Bank Offshore Wind Farm, are predicted to result in the annual	The Applicant acknowledges that in-combination collision mortality for kittiwake at the East Caithness SPA has the potential for an AEoSI. However, the contribution from the Green Volt project to the collision mortality in combination with other projects is predicted to be a maximum of 1.3 birds using the	No further action required

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
	population growth rate of kittiwake at the East Caithness Cliffs SPA declining, with a ratio of impacted to unimpacted population growth rate of 0.992. This means that after the 35-year lifetime of Green Volt Offshore Wind Farm, the population size of the SPA is expected to be 75.1% of what it would have been in the absence of the development. As such, RSPB Scotland consider potential AEoSI cannot be ruled out for kittiwake at the East Caithness Cliffs SPA	SNCB's approach and less than 1 bird using the Applicant's approach. The Applicant considers the contribution from the Green Volt Project to the in-combination impact to be intangible.	
35	Guillemot: Using the methods advocated by NatureScot, Marine Scotland Science and the RSPB during scoping, the impacts arising from distributional change associated with the presence of Green Volt Offshore Wind Farm in combination with other projects, not including Berwick Bank Offshore Wind Farm, are predicted to result in the annual population growth rate of guillemot at the East Caithness Cliffs SPA declining, with a ratio of impacted to unimpacted population growth rate of 0.996. This means that after the 35-year lifetime of Green Volt Offshore Wind Farm, the population size of the SPA is expected to be 88.5% of what it would have been in the absence of the development. As such, RSPB Scotland consider potential AEoSI cannot be ruled out for guillemot at the East Caithness Cliffs SPA.	The contribution from the Green Volt project to the displacement mortality in combination with other projects is predicted to be a maximum of 60 birds using the SNCB's approach and less than 13 birds using the Applicant's approach. However, taking consideration of the recent Beatrice report, providing evidence that guillemots from East Caithness Cliffs display no avoidance behaviour to the turbines at the Beatrice OWF, it is likely that displacement rates used in the assessment of impacts are overly precautionary for both Applicant's and SNCB's Approach. Therefore, the predicted population effects on the colony from displacement are considerably less or potential absent.	No further action required
	Highly Pathogenic Avian Influenza		
36	RSPB also wish to highlight the importance of the recent outbreak of Highly Pathogenic Avian Influenza (HPAI) on the seabird populations of the East Coast of the UK. This has strong implications for the assessment of offshore wind farms, particularly in the context of the robustness of the population to additional mortality and whether the population can continue to be considered in favourable conservation status. The impact of HPAI on seabirds also has a bearing on the imperative for the Scottish Government to urgently reduce pressures on and introduce measures to build resilience in wild	The Applicant notes the RSPB's comment on HPAI and awaits further updates as to what may be considered as the implications for any species or designated sites affected by it. However, it should be noted that as the digital aerial survey data for the Project were collected prior to the spread of HPAI in Scottish seabirds the assessments remain valid, as comparisons are made between a baseline for the Project with colony and population estimates that both pre-date the epidemic. HPAI was also considered within the Project's	No further action required.

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	birds. Sandeel management for example is not only needed to build resilience in seabird populations but if delivered appropriately, could also be an anti-HPAI measure. Ensuring birds have as much food available as close to the colony as possible, both reduces nutritional stress (which should increase disease resilience) and will minimise distance travelled and inter-colony movements, as birds which fail during breeding are more likely to leave the colony early and visit other colonies before departing on migration, increasing the potential risk of spreading HPAI.	application, including **EIA Report Chapter 12.11.6 Future Baseline Offshore**.	
Natural England			
37	In summary, Natural England broadly agree with the conclusions of the Habitat Regulation Assessment with respect to English waters. We note that Natural England's advice on ornithological modelling differs from NatureScot's advice. Although for the Green Volt project we advise no adverse effect on site integrity (for English protected sites and species), we are mindful of these differences and want to highlight them here. The increasing number of offshore wind projects, could lead to adverse effect on English and Scottish birds in combination with other plans or projects in the future. Although Natural England do not agree with the methods in the impact assessment, we do not expect the applicant to undertake a separate impact assessment based on Natural England's advice. In Annex 1 we provide Natural England's comments on this project, and a list of the documents that have been reviewed for this response is in Annex 2.	The Applicant welcomes Natural England's agreement with the conclusions made for English protected sites and species of no adverse effect on site integrity from the Green Volt Project and that no further assessments are required.	No further action required.
	Ornithology		
38	As the proposed development is in Scottish waters, the predicted impacts are mainly to Scottish Special Protection Areas (SPAs). Natural England have restricted comments to	The Applicant notes Natural England's comment and impacts to populations at English SPAs were considered in context to the wider network. This assessment is presented within the **EIA**	No further action required.

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	potential impacts at English SPAs. However, Natural England note that impacts at English SPAs need to be considered in the context of the wider network. We also note the need for a precautionary assessment of impacts given the recent and ongoing outbreaks of highly pathogenic avian influenza (HPAI) in seabirds.	**Report Chapter 12** when considering impacts at the BDMPS for species relevant seasons. The Applicant notes the Natural England's comment on HPAI and awaits further updates as to what may be considered as the implications for any species or designated sites affected by it. However, it should be noted that as the digital aerial survey data for the Project were collected prior to the spread of HPAI in Scottish seabirds the assessments remain valid, as comparisons are made between a baseline for the Project with colony and population estimates that both pre-date the epidemic. HPAI was also considered within the Project's application, including EIA Report Chapter 12.11.6 Future Baseline Offshore.	
39	Document reference: Report to inform Appropriate Assessment PC2483-RHD-ZZ-XX-RP-Z-0024 HRA Apportionment Annex. Use of sabbatical rates Natural England note that the applicant has excluded 'sabbatical birds' from the impact assessment, based on assumptions about the percentage of non-breeding adults in each population. Natural England note that we do not agree with the use of sabbatical rates to exclude sabbatical birds from impact assessment, nor do we consider the inclusion of sabbatical rates to be appropriate within the apportioning process. If there is clear evidence relating to the proportion of adults within the population likely to be taking a sabbatical in any given year, then this can be considered at the population modelling stage. The weight of evidence is on demonstrating: • the proportion of breeding adults in the population likely to be taking a sabbatical in any given year • whether the SPA population estimates include or exclude sabbatical birds, and • whether or not sabbatical birds are likely to use the area of sea around the SPA colony. This evidence can be used to inform whether or how sabbaticals are best incorporated in a Population Viability Analysis.	The Applicant acknowledges Natural England's approach for consideration of sabbatical birds, however, the Applicant in this instance has followed the approach taken in recent Scottish OWF Applications. The sabbatical rate for key seabird populations were agreed by Marine Science Scotland for the Seagreen 1 OWF Appropriate Assessment and subsequently used for other projects such as Moray West and other Forth and Tay projects and the recent Berick Bank project. Consideration must also be given to the project array area being located over 75 km from the coast at its nearest point and for kittiwake, guillemot and razorbill, is known to sit outside of the key foraging habitat identified by Wakefield et al., (2017) and Cleasby et al., (2018) during the breeding season. It is expected that there is greater likelihood of non-breeding birds being within the project area during the breeding season at these distances from the coast and therefore the sabbatical rates used would not be considered an overestimate.	No further action required.

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	However, in the absence of such evidence, Natural England's standard approach is to assume no sabbaticals, i.e., to assume all adult birds are breeding birds. Natural England note that the applicant has excluded 10% of kittiwakes, 10% of gannets, 7% of guillemots, 7% of razorbills and 7% of puffins from the impact assessment as 'sabbatical birds', without providing evidence in support of this approach as outlined above. Natural England therefore advises that all adult birds are assumed to be breeding birds within the impact assessment and note that the inclusion of these excluded sabbatical birds in the impact assessment would likely increase the predicted impacts for kittiwake, guillemot, razorbill, gannet, and puffin.		
40	Document reference: Report to inform Appropriate Assessment PC2483-RHD-ZZ-XX-RP-Z-0024 HRA Apportionment Annex. Use of stable age apportioning Natural England notes that the applicant has apportioned birds to age classes according to stable age structure calculated from population models for many species and seasons. Natural England does not support the use of the stable age structure approach for age apportioning, due to: • uncertainty regarding survival rates – in particular, for immature age classes • lack of info about non-breeding adult components of populations • the underlying assumption that populations are stable (which is not the case for many populations) Natural England therefore advise that, where possible, site-specific ageing data (e.g. from Digital Aerial Surveys, DAS) be used to age-apportion birds. Where this data is not available, Natural England advise that all 'adult-type' birds are apportioned as adults.	The Applicant acknowledges Natural England's approach for apportioning birds to age classes, however, the Applicant in this instance has followed NatureScot advice and the approach taken in recent Scottish OWF Applications. For the purpose of these assessments, the proportion of adult/ immature present in the project area during the breeding season is based on using Appendix A of Furness (2015) stable age structure data.	No further action required.
41	General comments Highly Pathogenic Avian Influenzas- Population Viability Analysis	The Applicant notes the RSPB's comment on HPAI and awaits further updates as to what may be considered as the implications for any species or designated sites affected by it.	No further action required.

Item No.	Issue raised	Applicant's response	Action agreed following consultee meeting
	Natural England note that there is uncertainty regarding population trends of kittiwake, guillemot, razorbill, gannet and puffin given recent and possibly ongoing impacts of highly pathogenic avian influenza (HPAI). Since the project's surveys, the species of protected sites have been significantly impacted by HPAI and we have limited understanding of how current and future breeding seasons will be further impacted by HPAI. Natural England note there is therefore a need for a precautionary approach when interpreting Population Viability Analysis outputs in the context of predicted population trends	However, it should be noted that as the digital aerial survey data for the Project were collected prior to the spread of HPAI in Scottish seabirds the assessments remain valid, as comparisons are made between a baseline for the Project with colony and population estimates that both pre-date the epidemic. HPAI was also considered within the Project's application, including EIA Report Chapter 12.11.6 Future Baseline Offshore.	

3. Collison Risk Modelling

3.1 Introduction and Methodology

In accordance with NatureScot's most recent guidance on collision risk modelling for marine birds, Bird Guidance Note 7 (NatureScot, 2023a), the Applicant has undertaken a re-assessment of collision risk impacts from the Project. Bird Guidance Note 7 (NatureScot, 2023a) was not available at the time of undertaking assessments for this Project and contains significant updates to the recommended parameters for both the Basic Band model (Band *et al*., 2012) and the stochastic collision risk model (sCRM) (McGregor *et al*., 2018).

Bird Guidance Note 7 recommends the use of the sCRM and requires that outputs for both stochastic and deterministic CRM are presented.

Input parameters that have been updated in line with Bird Guidance Note 7 and any approach that differs to the collision risk modelling previously undertaken for the Project and submitted in the Green Volt application are provided below:

- Avoidance rates have been revised following the evidence reviews undertaken by Ozsanlev-Harris *et al*. (2023). With respect to gannet and kittiwake, Bird Guidance Note 7 recommends significantly higher avoidance rates than previously advocated, reducing the risk to both species from collision mortality.

- The use of Band Option 3 requires the use of site-specific avoidance rates to be calculated. However, as these values are not available for the Project's site this option is not possible and therefore not presented in the updated assessment.

- Seabird biometrics now include standard deviations when run stochastically, which were included where applicable and are reflected in the outputs.

- Flight type has been changed to gliding for gannet, in place of flapping.

- Flight speeds recommended in the Bird Guidance Note 7 have been used in the CRM following the 'SNCB's approach' and are derived from the studies of Pennycuick (1997) and Alerstam *et al*., (2007). The CRM following the Applicant's approach uses alternate flight speeds from a more recent and comprehensive study published by Skov *et al*. (2018) which state slower flight speeds.

There remain only minimal differences between the two approaches modelling for collision risk between the SNCB's approach and the Applicant's approach. The Applicant's decision to provide an alternate assessment that deviates from the parameters within Bird Guidance Note 7 for assessing collision risk is based on the following information:

- NatureScot's recommendation for flight speeds is sourced from Pennycuick (1987), which is based on 32 cliff-based observations of gannets using an ornithodolite (Pennycuick, 1982) over a period of 12 days on the island of Foula. The instrument used is for flight speed estimates at short ranges of up to 295 m (Pennycuick, 1983) and with a position error of about 2.6 m at 100 m and 8 m at maximum range. The precision of the instrument was described, in the words of the author, as 'not very high' (Pennycuick, 1982).
- The Applicant's approach is based on more up-to-date evidence using more modern technology, which is from a study by Skov *et al*., (2018). This study used laser rangefinder tracking data to estimate flight speed both inside and outside the Thanet OWF from 706 tracks over a period of approximately two years. The Applicant's use of Skov *et al*., (2018) data is consistent with other recent collision risk assessments for UK OWFs (The Crown Estate, 2022) and, therefore, the Applicant considers such estimates on gannet flight speed to be more accurate and more representative of flight behaviour around OWFs and their wind turbine generators (WTGs) in comparison to Pennycuick's cliff-based observations.
- Nocturnal activity factors (NAFs) currently advocated by NatureScot are derived from the scoring index for nocturnal activity presented in Garthe and Hüppop (2004), based on literature review and personal observations. These index values were then converted into a nocturnal activity factor as follows; 1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%. The exception being for gannet, where NAF values are derived from the review by Furness et al., (2018).
- The Applicant's approach is based on recent reviews of nocturnal activity (MacArthur Green *et al*., 2015; Masden 2015; Skov *et al*., 2018) that suggest significantly lower nocturnal activity than the scores presented by Garthe and Hüppop (2004), especially during the breeding season. The Applicant's approach when specifying the NAF for the deterministic model, therefore, uses these reviews for gannet and kittiwake which are considered to provide a more realistic and accurate representation of the NAF for these species. Both the Applicant's and SNCB's approach when specifying the NAF for the stochastic model utilise the values specified by Natural England in their interim guidance on collision risk modelling (Natural England, 2023). These are based on the Garthe and Hüppop (2004) values and Furness *et al*., (2018) for gannet as recommended in NatureScot guidance note 7 (NatureScot, 2023a).

In summary it is, therefore, considered that the Applicant's approach uses the best available evidence relevant to flight speeds for gannet (Skov *et al*., 2018) and nocturnal activity factors for gannet and kittiwake (MacArthur Green *et al*., 2015). This report provides supplementary information incorporating the latest recommendations from NatureScot's Guidance Note 7 (NatureScot, 2023a) that were not published prior to the EIA submission (**EIA Report Chapter 12, Technical Appendix 12.3 Offshore Ornithology: Collision Risk Modelling**). The Report provides supplementary data for both the Applicant's approach and SNCB's approach for the CRM assessments.

Details of the parameters used and the differences between the Applicant's and SNCB's approaches are summarised in **Table 2**. Parameters highlighted in green indicate values used are the same for both approaches, orange cells where values are similar and red cells highlight differences in the parameter values used for the Applicant's versus the SNCB's approach.

Table 2. Differences in CRM input parameters between the Applicant's approach and the SNCB's recommended approach.

Parameter	Species	Deterministic		Stochastic	
		Applicant's approach	SNCB's approach	Applicant's approach (SD)	SNCBs approach (SD)
Species biometrics (Body length/ wingspan(m))	Gannet	0.94/ 1.72	0.94/ 1.72	0.94 (0.033)/ 1.72 (0.038)	0.94 (0.033)/ 1.72 (0.038)
	Kittiwake	0.39/ 1.08	0.39/ 1.08	0.39 (0.005)/ 1.08 (0.063)	0.39 (0.005)/ 1.08 (0.063)
	Herring gull	0.60/ 1.44	0.60/ 1.44	0.60 (0.023)/ 1.44 (0.030)	0.60 (0.023)/ 1.44 (0.030)
	Great black-backed gull	0.71/ 1.58	0.71/ 1.58	0.71 (0.035)/ 1.58 (0.038)	0.71 (0.035)/ 1.58 (0.038)
Avoidance rate (BO2)	Gannet	0.992	0.992	0.993 (0.0003)	0.993 (0.0003)
	Kittiwake	0.992	0.992	0.993 (0.0003)	0.993 (0.0003)
	Herring gull	0.994	0.994	0.994 (0.0004)	0.994 (0.0004)
	Great black-backed gull	0.994	0.994	0.994 (0.0004)	0.994 (0.0004)
Flight speed (m/s)	Gannet	13.33	14.9	13.33 (4.24)	14.9 (0)
	Kittiwake	8.71	13.1	8.71 (3.16)	13.1 (0.4)
	Herring gull	9.68	12.8	9.68 (3.47)	12.8 (1.8)
	Great black-backed gull	9.78	13.7	9.78 (3.65)	13.7 (1.2)
	Gannet	2	8	8 (0)	8 (0)
	Kittiwake	12	25 – 50	38 (6)	38 (6)

Parameter	Species	Deterministic		Stochastic	
		Applicant's approach	SNCB's approach	Applicant's approach (SD)	SNCBs approach (SD)
Nocturnal Activity Factor (%)	Herring gull	25	25 – 50	38 (6)	38 (6)
	Great black-backed gull	25	25 – 50	38 (6)	38 (6)
Flight heights	Gannet	Johnston *et al.* (2014) Maximum Likelihood	Johnston *et al.* (2014) Maximum Likelihood	Johnston *et al.* (2014) Maximum Likelihood	Johnston *et al.* (2014) Maximum Likelihood
	Kittiwake				
	Herring gull				
	Great black-backed gull				

Green cells indicate both parties agree on the input parameter, orange indicates partial agreement and red indicated disagreement on the input parameter. Comparisons are separate for the deterministic and stochastic models.

3.2 SD calculations for seabird densities

In response to a query from NatureScot on the Applicant's use of Standard Deviation (SD) calculations for density estimates used in collision risk modelling the Applicant has provided a detailed explanation of the calculation method used (see **Section 3.2.1)**.

The Applicant can confirm that NatureScot's understanding is correct, in that one SD is estimated to be approximately 25% of the 95% confidence limits, in line with the expectation of a normal distribution. The observed distribution will not be a perfect normal distribution and in some cases will show a skewed distribution, and for that reason the report makes it clear that this approach provides only an approximate value for the SD. However, given a sufficiently large sample size it is generally reasonable to approximate the distribution with a normal distribution. The approximate approach is necessary because of the complications of robustly propagating uncertainty through the process of apportioning unidentified birds to species level, given that the approach to apportionment relies on the abundances of birds identified to species level, and in some cases is required to consider data from wider survey areas and/or alternative time periods. Therefore, the approach given to approximate one SD is considered the best option available.

3.2.1 Calculation method

Density estimates needed to conduct CRM were determined for the Project using data collected across 24 months of baseline digital aerial surveys (DAS), carried out between May 2020 and April 2022, inclusive. The data used are presented in **Appendix 12.1 Offshore and Intertidal Ornithology Baseline Technical Report** of the Offshore EIA Report. The density data used for CRM are inclusive of apportionment of unidentified birds. The minimum CRM scenario used mean - 1 SD density estimates, while the maximum CRM scenario used mean + 1 SD density estimates for all species.

One SD was estimated using the following equation:

1 SD ≈ (Maximum - Minimum) / 4

Where "Maximum" is the higher of the two upper 95% confidence limit (CL) estimates for a given calendar month, and "Minimum" is the lower of the two lower CL estimates for the same calendar month. An example is given below for the calendar month of July (**Table 3**).

Table 3. Example values used to calculate one SD.

Survey	Density (birds/ km^2)		
	Mean	Lower CL	Upper CL
May 2020	0.27	0.09	0.70
May 2021	0.08	0.00	0.23

An example of how the data in **Table 3** is used to calculate mean ± one SD is provided below:

1 SD ≈ (0.70 – 0.00) / 4 = 0.18

Mean = (0.27 + 0.08) / 2 = 0.17 birds/km2

Mean + 1 SD = 0.35 birds/km2

Mean - 1 SD = 0.00 birds/km2.

The mean densities for each species are presented in **Table 4**, where values in brackets represent the SD value. The densities alone are used when modelling collisions deterministically, whereas SDs are incorporated around densities when conducting stochastic CRM.

Table 4. Densities of seabird species used in CRM with standard deviations for use in the stochastic CRM model.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kittiwake	0.150 (0.03)	0.068 (0.02)	0.157 (0.12)	0.107 (0.05)	0.107 (0.00)	0.252 (0.21)	0.287 (0.11)	0.017 (0.00)	0.232 (0.00)	0.086 (0.00)	0.368 (0.18)	0.230 (0.18)
Gannet	0.235 (0.19)	0.086 (0.08)	0.086 (0.08)	0.154 (0.10)	0.171 (0.18)	0.402 (0.30)	0.437 (0.28)	0.116 (0.08)	0.518 (0.21)	0.051 (0.05)	0.017 (0.07)	0.000 (0.00)
Herring gull	0.334 (0.00)	0.034 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.017 (0.03)	0.036 (0.04)
Great black-backed gull	0.235 (0.00)	0.051 (0.02)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.034 (0.00)	0.069 (0.06)	0.035 (0.02)

3.3 Results – CRM following the Applicant's Approach

This section provides a summary of the of CRM following the Applicant's approach for each of the four seabird species modelled. Results are provided as annual totals as well as being split into seasons following NatureScot's Bird Guidance Note 9: Guidance to support Offshore Wind applications: Marine Ornithology Advice for Seasonal Definitions for Birds in the Scottish Marine Environment (NatureScot, 2020c). A summary of all monthly outputs are presented in Appendix 1 0.The Applicant's Approach differs from the SNCB's Approach through the flight speed value used for gannet. In addition, when modelled deterministically, the NAF values also differ between approaches for all four species. These parameters and all other seabird biometric parameters used for the CRM following the Applicant's Approach are in **Table 2**.

3.3.1 Gannet

The seasonal and annual predicted gannet collision mortality values using Band Option 2 are presented in **Table 5** following the Applicant's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision mortality rates are presented in **Figure 1** and 0. Collision risk input parameters used to determine the number of collisions are presented in **Table 2**.

Table 5. Predicted seasonal and annual collision mortality for gannet (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Return migration	Dec- Mar	1.92	2.28
Migration-free breeding	Apr- Sep	13.55	13.39
Post-breeding migration	Oct- Nov	0.34	0.57
Annual total		15.8	16.2 (4.5)

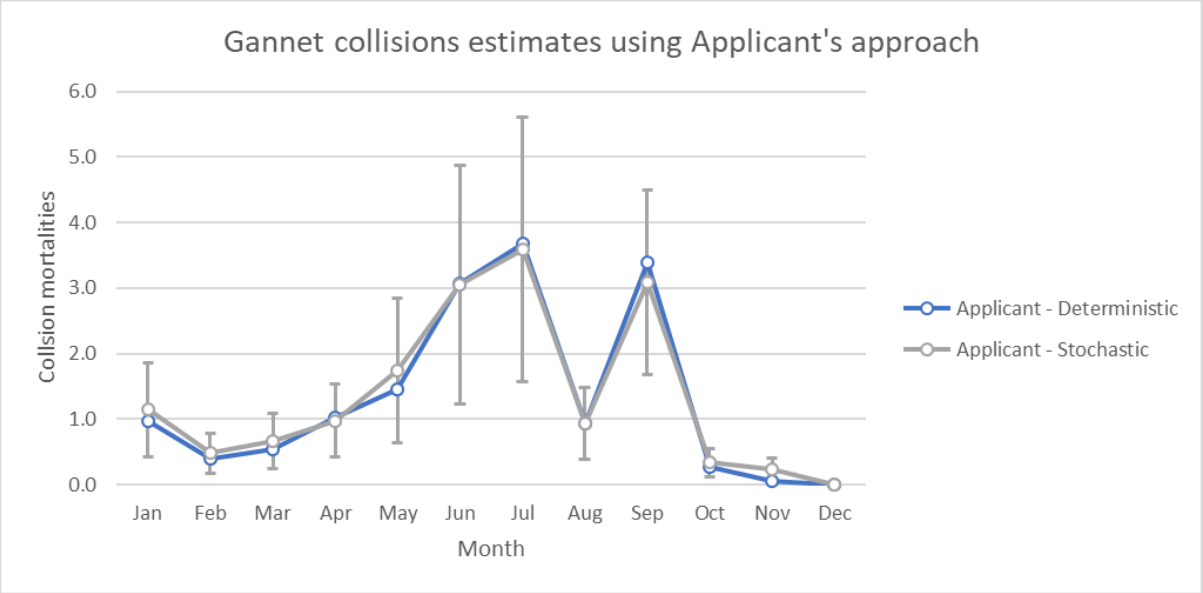

Figure 1. Predicted monthly collision mortality for gannet (error bars show SD) using the Applicant's approach modelled stochastically.

3.3.2 Kittiwake

The seasonal and annual predicted kittiwake collision mortality values using Band Option 2 are presented in **Table 6** following the Applicant's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision mortality rates are presented in **Figure 2** and **Appendix 1** . Collision risk input parameters used to determine the number of collisions is presented in **Table 2**.

Table 6. Predicted seasonal and annual collision mortality for kittiwake (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Return migration	Jan- mid Apr	2.0	2.5
Migration-free breeding	Mid Apr- Aug	3.8	4.0
Post-breeding migration	Aug- Dec	3.3	4.1
Annual total		9.1	10.6 (2.9)

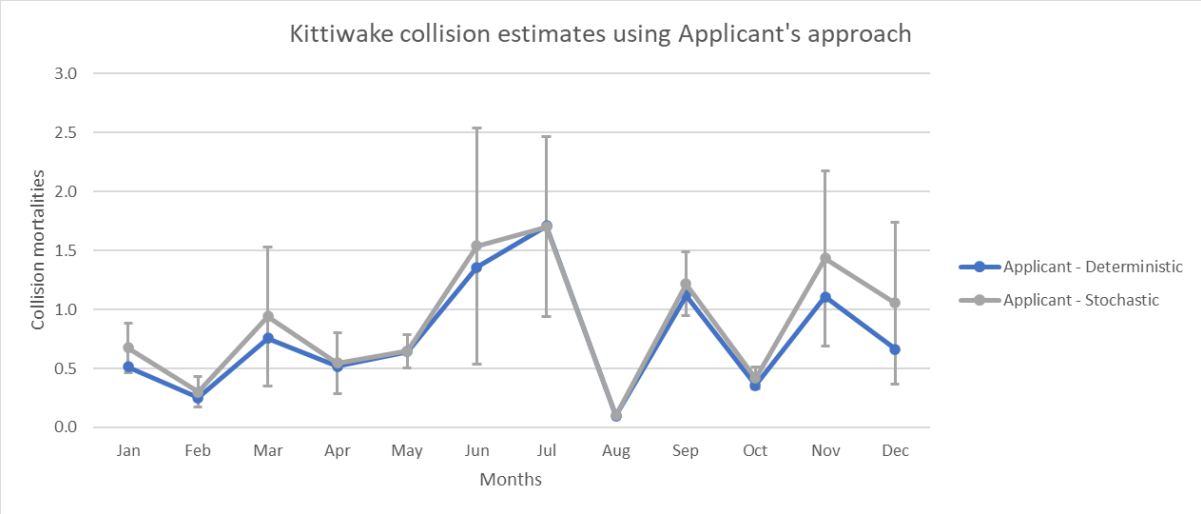

Figure 2. Predicted monthly collision mortality for kittiwake (error bars show SD) following the Applicant's Approach, modelled stochastically.

3.3.3 Herring gull

The seasonal and annual predicted herring gull collision mortality values using Band Option 2 are presented in **Table 7** following the Applicant's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision mortality rates are presented in **Figure 3** and 0. Collision risk input parameters used to determine the number of collisions is presented in **Table 2**.

Table 7. Predicted seasonal and annual collision mortality for herring gull (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Breeding	Apr- Aug	0.00	0.00
Non-breeding	Sep- Mar	3.76	4.68
Annual total		3.80	4.70 (1.1)

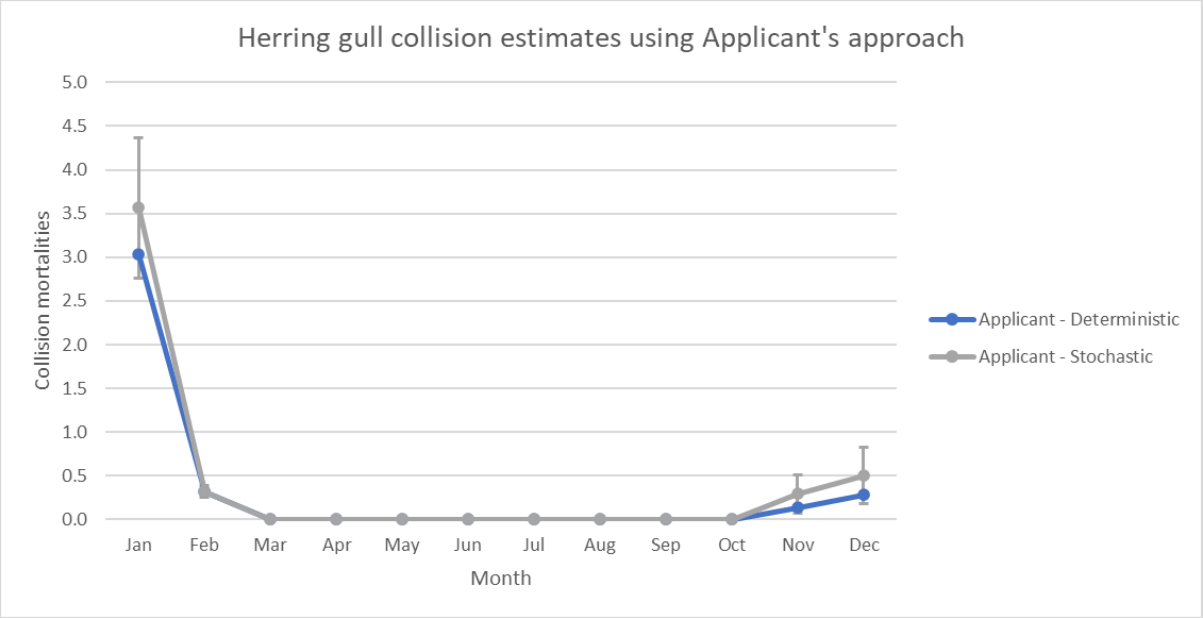

Figure 3. Predicted monthly collision mortality for herring gull (error bars show SD) following the Applicant's Approach, modelled stochastically.

3.3.4 Great black-backed gull

The seasonal and annual predicted great black-backed gull collision mortality values using Band Option 2 are presented in **Table 8** following the Applicant's approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision mortality rates are presented in **Figure 3** and 0. Collision risk input parameters used to determine the number of collisions is presented in **Table 2**.

Table 8. Predicted seasonal and annual collision mortality for great black-backed gull (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Breeding	Apr- Aug	0.0	0.1
Non-breeding	Sep- Mar	4.1	5.3
Annual total		4.1	5.4 (1.4)

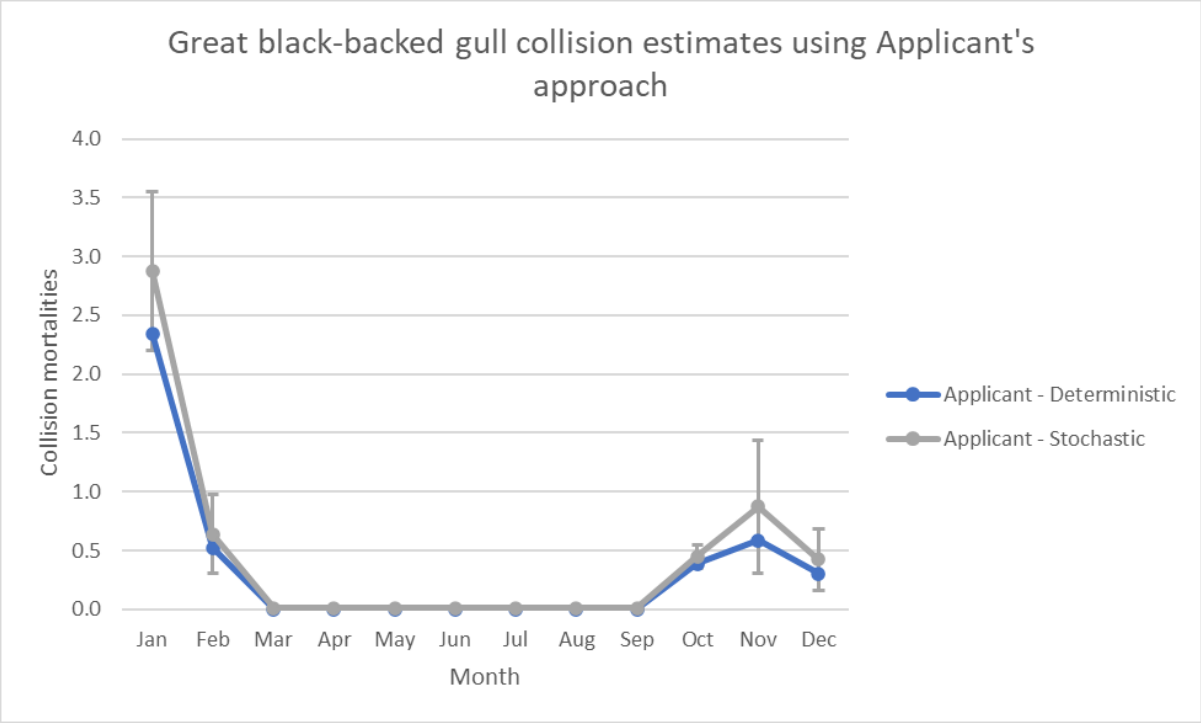

Figure 4. Predicted monthly collision mortality for great black-backed gull (error bars show SD) following the Applicant's Approach, modelled stochastically.

3.4 Results – CRM following the SNCB's Approach

This section provides a summary of the CRM results following the SNCB's Approach for each of the four seabird species modelled. Results are presented as annual totals as well as being split into seasons according to NatureScot's Bird Guidance Note 7 (NatureScot, 2023a). A summary of all monthly outputs are presented monthly in 0. The Applicant's Approach differs from the SNCB's Approach through the flight speed values used for gannet. In addition, when modelled deterministically, the NAF values also differ between approaches for all four species. These parameters and all other seabird biometric parameters used for the CRM following the Applicant's Approach are in **Table 2**.

3.4.1 Gannet

The seasonal and annual predicted gannet collision mortality values using Band Option 2 are presented in **Table 9** following the SNCB's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision mortality rates are presented in **Figure 5** and **Appendix 1** 0.

Table 9. Predicted seasonal and annual collision mortality for gannet (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Return migration	Dec- Mar	2.3	2.4
Migration-free breeding	Apr- Sep	14.9	14.5
Post-breeding migration	Oct- Nov	0.4	0.6
Annual total		17.6	17.5 (3.7)

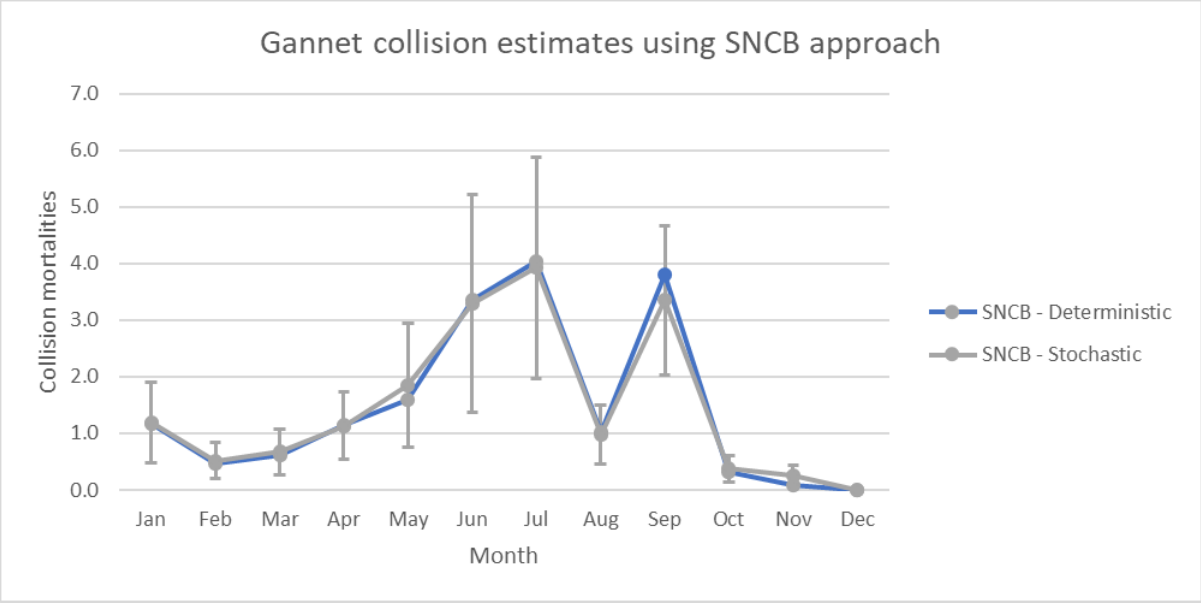

Figure 5. Predicted monthly collision mortality for gannet (error bars show SD) following the SNCB's Approach, modelled stochastically.

3.4.2 Kittiwake

The seasonal and annual predicted kittiwake collision mortality values using Band Option 2 are presented in **Table 10** following the SNCB's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision rates are presented in **Figure 6** and **Appendix 1** 0.

Table 10. Predicted seasonal and annual collision mortality for kittiwake (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Return migration	Jan- mid Apr	3.2 – 3.9	3.3

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Migration-free breeding	Mid Apr- Aug	5.4 – 5.9	5.2
Post-breeding migration	Aug- Dec	5.2 – 6.7	5.4
Annual total		13.8 – 16.5	13.9 (2.3)

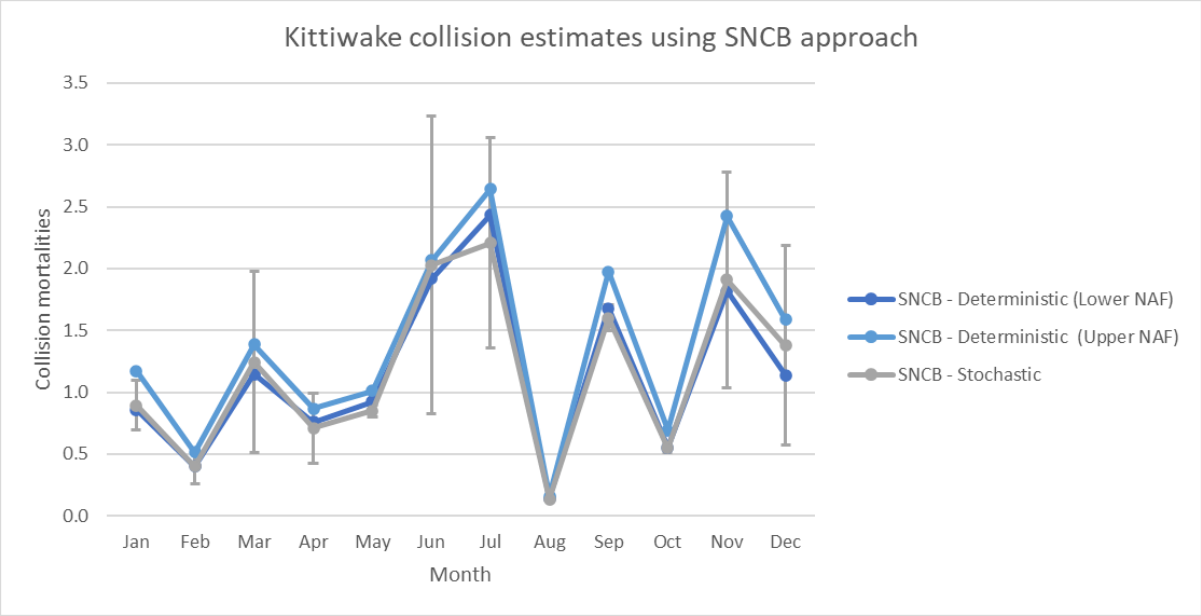

Figure 6. Predicted monthly collision mortality for kittiwake (error bars show SD) following the SNCB's Approach, modelled stochastically.

3.4.3 Herring gull

The seasonal and annual predicted herring gull collision mortality values using Band Option 2 are presented in **Table 11** following the SNCB's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision rates are presented in **Figure 7** and **Appendix 1** 0.

Table 11. Predicted seasonal and annual collision mortality for herring gull (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Breeding	Apr- Aug	0.0 – 0.0	0.1
Non-breeding	Sep- Mar	4.6 – 6.2	5.8
Annual total		4.6 – 6.2	5.8 (0.9)

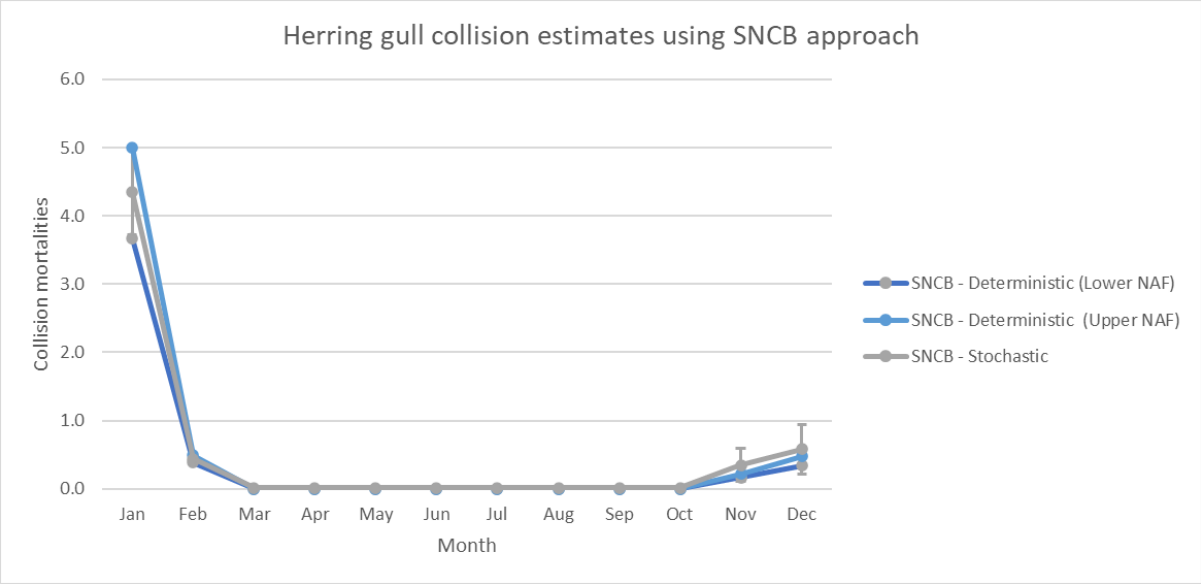

Figure 7. Predicted monthly collision mortality for herring gull (error bars show SD) following the SNCB's Approach, modelled stochastically.

3.4.4 Great black-backed gull

The seasonal and annual predicted great black-backed gull collision mortality values using Band Option 2 are presented in **Table 12** following the SNCB's Approach. The values presented were determined by both the deterministic and stochastic CRM methods. The corresponding monthly predicted collision rates are presented in **Figure 8** and **Appendix 1** 0.

Table 12. Predicted seasonal and annual collision mortality for great black-backed gull (BO2).

Season	Months	Predicted annual collisions	
		Deterministic	Stochastic (SD)
Breeding	Apr- Aug	0.0 – 0.0	0.1
Non-breeding	Sep- Mar	5.2 – 6.9	6.9
Annual total		5.2 – 6.9	7.0 (1.4)

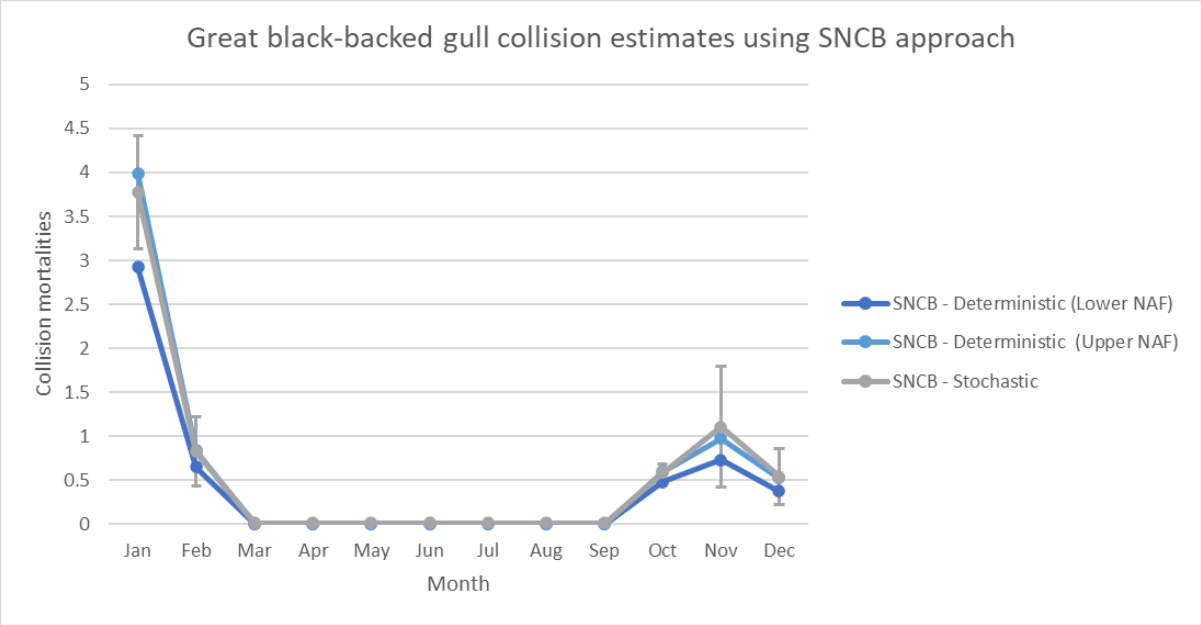

Figure 8. Predicted monthly collision mortality for great black-backed gull (error bars show SD) following the SNCB's Approach, modelled stochastically.

3.5 Comparison in CRM Outputs between the Applicant's and SNCB's Approaches

Due to the difference in approach to the CRM, with alternate input parameter values used in some instances, there are differences in the predicted number of potential collisions for the Project. In order to understand these differences, comparisons and discussion on the summary results are provided for each species, whilst the complete set of results are presented within **Appendix 1** .

3.5.1 Gannet CRM variability

Overall, the predicted collisions for gannet were higher when modelled using any of the SNCB's Approaches in comparison to the Applicant's Approaches (**Figure 9**). The biggest difference in the results between the SNCB's Approach and the Applicant's occurred when using the CRM deterministically, though the difference in value was still under two (1.8) birds.

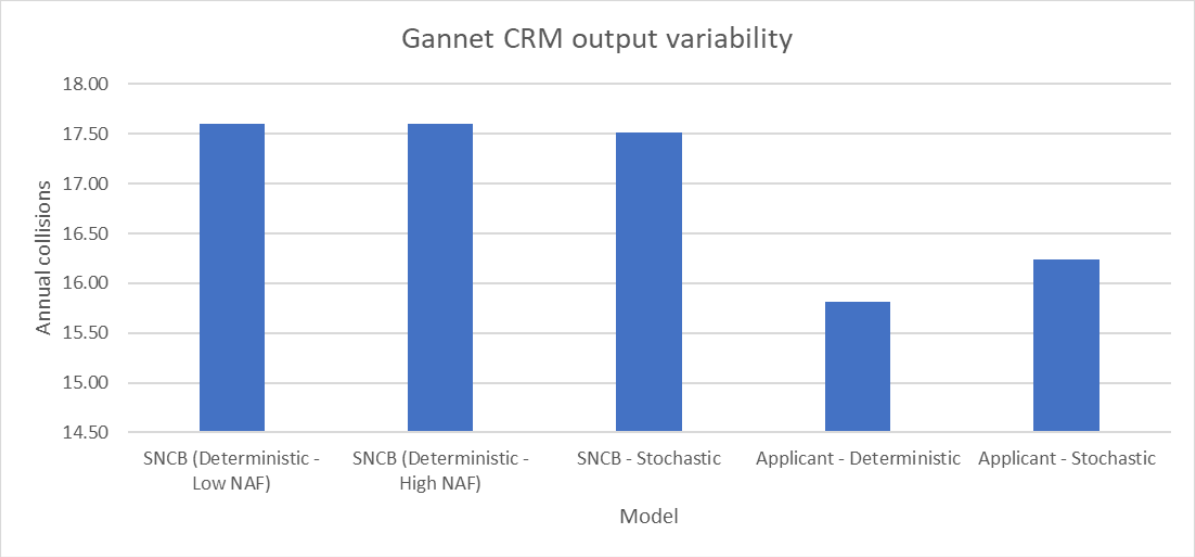

Figure 9. Differences in collision risk estimates between the SNCB's Approach and Applicant's Approaches for gannet.

3.5.2 Kittiwake CRM variability

Overall, the predicted collisions for kittiwake were higher when modelled using any of the SNCB's Approach in comparison to the Applicant's Approaches (**Figure 10**). The biggest difference in the results between the SNCB's Approach and the Applicant's Approaches occurred when using the CRM deterministically, with the difference in value being approximately seven (7.4) birds.

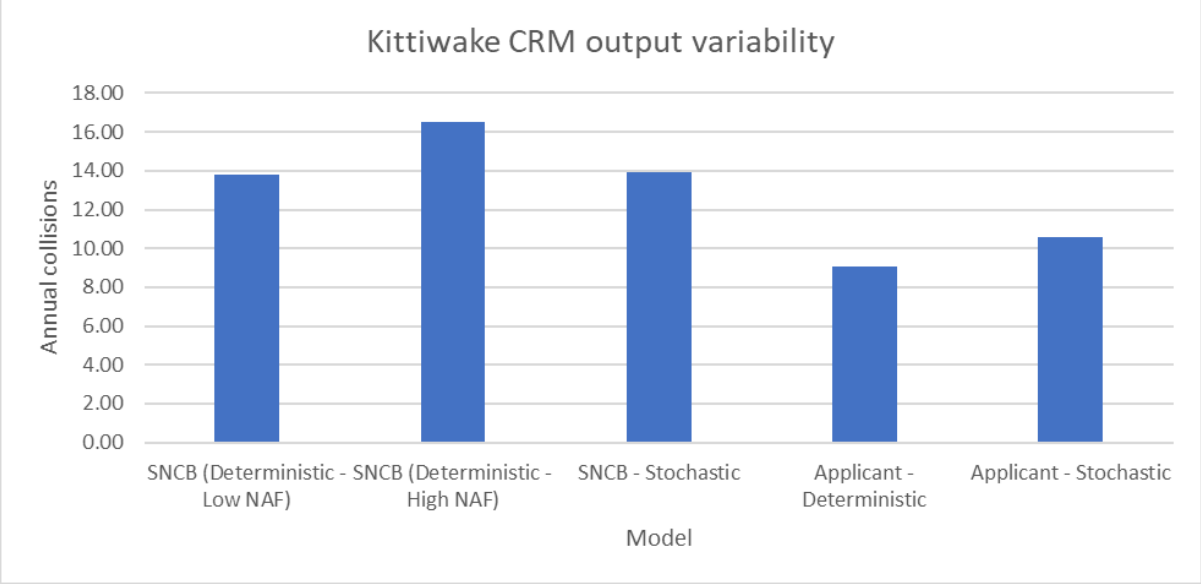

Figure 10. Differences in collision risk estimates between the SNCB's Approach and Applicant's Approaches for kittiwake.

3.5.3 Herring gull CRM variability

Overall, the predicted collisions for herring gull were higher when modelled using any of the SNCB's Approach in comparison to the Applicant's Approaches (**Figure 11**). The biggest difference in the results between the SNCB's Approach and the Applicant's Approaches occurred when using the CRM deterministically, with difference in value being approximately two (2.4) birds.

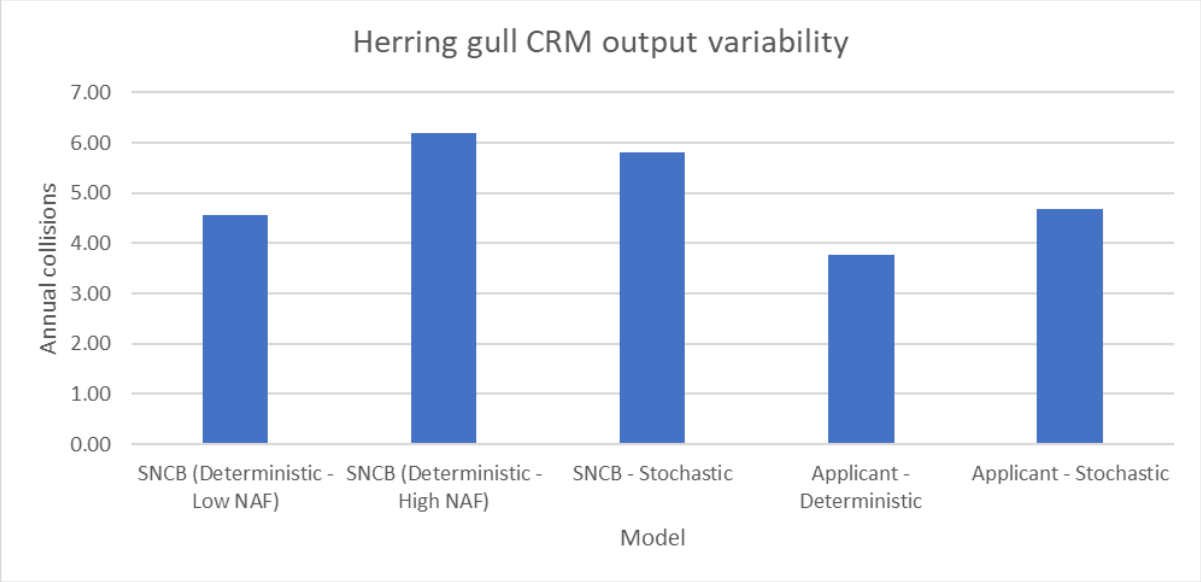

Figure 11. Differences in collision risk estimates between the SNCB and Applicant approaches for herring gull.

3.5.4 Great black-backed gull CRM variability

Overall, the predicted collisions for great black-backed gull were higher when modelled using any of the SNCB's Approaches in comparison to the Applicant's Approaches (**Figure 12**). The biggest difference in the results occurred when comparing SNCB's Approach using the stochastic CRM and the Applicant's Approach using the deterministic CRM, with the difference being under three (2.8) birds.

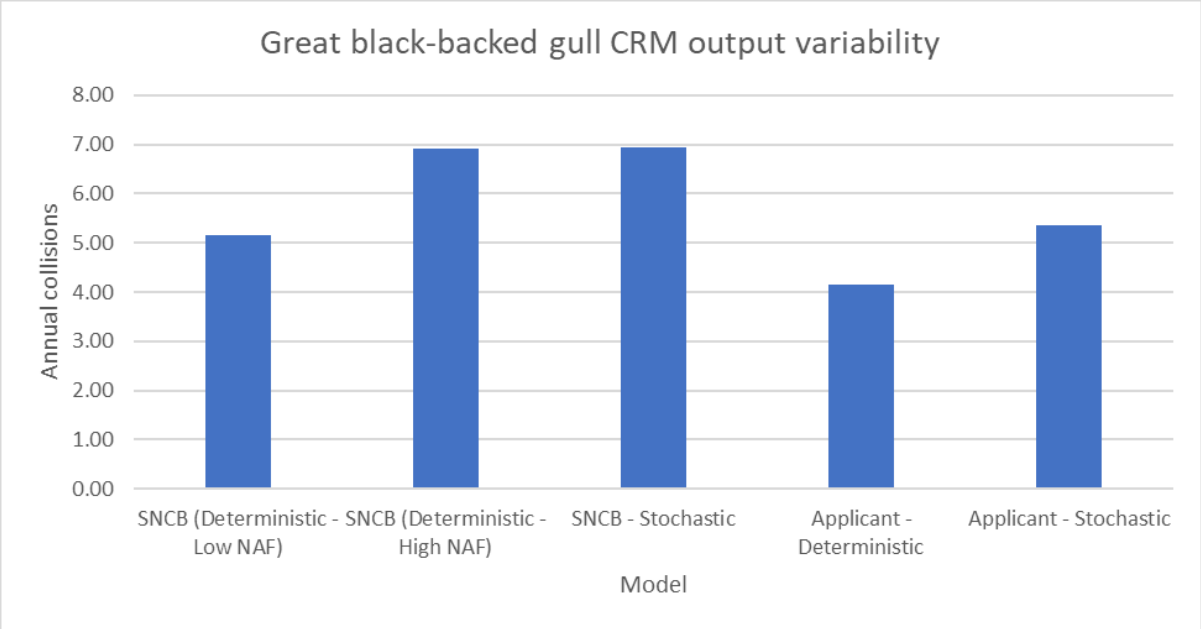

Figure 12. Differences in collision risk estimates between the SNCB's Approach and Applicant Approaches for great black-backed gull.

3.6 CRM Discussion

As presented in **Section 3.5**, predicted collision impacts for the four modelled seabird species were lower when following the Applicant's Approach than when following the SNCB's Approach. The differences between the two approaches are due to differences in the flight speed data for gannet and the nocturnal activity factors used for all four species. The SNCB's Approach promotes the use of the latest guidance by Nature Scot (2023), whereas the Applicant's Approach follows the majority of advice in the latest guidance from NatureScot (2023), but also utilises values from the best available scientific evidence.

With the exception of great-black backed gull, for all other species the greatest difference in collision risk estimates was between the Applicant's Approach modelled deterministically and the SNCB's Approach modelled deterministically when using the higher of the two NAF values. Great black-backed gull had the greatest differences between the SNCB's Approach modelled stochastically and the Applicant's Approach modelled deterministically. Those differences are summarised for each species as follows:

- For gannet the greatest difference in collision risk estimates was by two individuals, representing a 10.2% reduction between the SNCB's Approach and the Applicant's Approach. When considering the difference in the parameter values, flight speed decreased by 1.57 m/s with NAF reducing by a value of six when using the Applicant's Approach;
- For kittiwake the greatest difference in collision risk estimates was by seven individuals, representing a 44.8% reduction between the SNCB's Approach and the

Applicant's Approach. When considering the difference in parameter values from the SNCB's Approach to the Applicant's Approach, flight speed decreased by 4.31 m/s and the NAF value decreased by 38;

- Both herring gull and lesser black-backed gull had lower collision risk estimates in general, but still showed marked differences in the outputs between the two approaches to CRM. Herring gull mortalities due to collisions were lower by three individuals when modelled using the parameters following the Applicant's Approach, with a reduction of 39.2% in comparison to the outputs following the SNCB's Approach. The parameters were lower for the Applicant's Approach with a reduction of 3.02 m/s for flight speed and 25 for NAF value; and
- For great black-backed gull the greatest difference in collision risk estimates was by two individuals, representing a reduction of 40.4% between the SNCB's Approach and the Applicant's Approach deterministically. The differences in parameters used were again reduced in the Applicant's Approach with a reduction in flight speed of 3.9 m/s and a reduction of the NAF value of 25.

It is clear that the differences in parameter values between the two CRM approaches have an effect on the collision mortality estimates provided. When relying on more historic data sets and evidence the CRM output values result in more precautionary collision mortality estimates that are more exaggerated in certain species. It is the Applicant's expert opinion that CRM benefits from the use of the most robust and up-to-date scientific evidence, such as those following the Applicant's Approach, to ensure both the maximum and most realistic collision mortality estimates can be considered without over-inflating the potential risk levels.

4. HRA Apportionment

4.1 Breeding season colony counts

As described in the **Green Volt EIA Report Technical Appendix 12.5: Colony counts and derived breeding populations used in assessments**, breeding population size calculations are based on the colony counts from the UK's Seabird Monitoring Programme (SMP) database (JNCC, 2023). For clarity, sub-colonies have been grouped in order to provide transparency and to highlight the main SPA they contribute to. In addition, the individuals from the sub-colonies have been added together to provide SPA total individuals that are used in the further assessments. The breakdown of SPAs and the sub-colonies that feed into them, along with the individuals contributing to these sites, can be seen in **Table 13** to **Table 17** below. The years that the colony counts were recorded in are also provided. For reference, counts of apparently occupied sites (AOS) and apparently occupied nests (AON) are considered to represent the number of pairs of breeding birds nesting, so these counts are doubled in order to get total breeding individuals.

Table 13. Breeding colony counts for kittiwake.

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
Buchan Ness to Collieston Coast	N/A	2017	22,590	11,295	22,590
Troup, Pennan and Lion's Head	Aberdour Bay	2017	21,232	2,393	4,786
	Troup and Lion's Head RSPB	2017		6,797	13,594
	Pennan Head	2017		555	1,110
	West Quarry Head	2017		1	2
	Crovie to Collie Head	2017		758	1,516
	More Head - Crovie Pier	2017		112	224
Fowlsheugh	Swallow Cove - Crawton	2018	28,078	2,156	4,312
	Thornyhive Bay	2018		1,671	3,342
	Tremuda/ Old Hall Bay	2018		768	1,536
	Fowlsheugh RSPB	2018		9,444	18,888
East Caithness Cliffs	N/A	2016	48,920	24,460**	48,920
North Caithness Cliffs	N/A	2016	11,136	5,568***	11,136
Copinsay	N/A	2015	1,910	955	1,910
Hoy	Old Man of Hoy to Rora	2017	608	29	58
	HOY 8	2017		9	18
	Hoy RSPB Reserve	2017		38	76
	HOY 17	2016		228	456
Fair Isle	N/A	2021	646	323	646

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
Calf of Eday	N/A	2018	284	142	284
Rousay	Rousay 1 - RSPB	2016	660	232	464
	Rousay 4	2016		2	4
	Rousay 7	2016		6	12
	Rousay 8	2016		6	12
	Rousay 11	2016		54	108
	Rousay 12	2016		30	60
West Westray	West Westray 1	2017	5,110	12	24
	Noup Cliffs RSPB	2017		1,822	3,644
	West Westray 5	2017		495	990
	West Westray 6	2017		426	852
Marwick Head	N/A	2018	1,812	906	1,812
Forth Islands	Craigleith	2022	7,162	122	244
	The Lamb	2022		2	4
	Bass Rock	2022		569	1,138
	Fidra	2022		372	744
	Isle of May	2018		2,516	5,032
Sumburgh Head	Grutness Pier to Greystane Geo	2021	864	43	86
	Geo of Parks to Jarlshof	2021		147	294
	Sandwick to Virkie	2018		1	2

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
	Sumburgh Head	2017		241	482
St. Abb's Head to Fast Castle	St Abb's Head NNR	2021	9,200	4,600	9,200
Noss	N/A	2021	154	77	154
Cape Wrath	Clo mor 10	2017	7,216	329	658
	Cape Wrath 4	2017		181	362
	Clo Mor 5	2017		39	78
	Clo Mor 7	2017		350	700
	Clo Mor 8	2017		906	1,812
	Clo Mor 9	2017		1,633	3,266
	Clo Mor 11	2017		170	340
Foula	N/A	2021	850	425	850
Handa	N/A	2018	5,150	2,575	5,150
Pentland Firth Islands	Swona	2021	354	1	2
Pentland Firth Islands	Muckle Skerry	2021		176	352
Ythan Estuary, Sands of Forvie and Meikle Loch SPA	N/A	2019	774	387	774
Sule Skerry and Sule Stack	Sule Skerry	2018	100	50	100
North Hill and Holm	North Hill RSPB	2019	30	15	30
Papa Stour	Papa Stour Whole Islands	2021	50	25	50
N/A	Whiting Ness to Ethie Haven 4	2018		410	820

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
N/A	Whiting Ness to Ethie Haven 1	2018		250	500
N/A	Auchmithie	2018		7*	7
N/A	Buckiemill	2017		370	740
N/A	Fraserburgh Harbour	2021		81	162
N/A	Peterhead South Harbour	2021		33	66
N/A	Snow Craig	2017		25	50
N/A	Head of Garness	2017		3	6
N/A	Findlater	2017		79	158
N/A	Garron Point	2017		217	434
N/A	Redhythe Point	2017		220	440
N/A	Eyemouth to Burnmouth 1	2018		60	120
N/A	Eyemouth to Burnmouth 2	2018		171	342
N/A	Eyemouth to Burnmouth 3	2018		6	12
N/A	Eyemouth to Burnmouth 4	2018		62	124
N/A	Eyemouth to Burnmouth 5	2018		114	228
N/A	Eyemouth to Burnmouth 6	2018		158	316
N/A	Eyemouth to Burnmouth 7	2018		138	276
N/A	Noss Head	2018		45	90
N/A	Hare Ness to Seal's Cove	2017		812	1,624
N/A	Grey Ness - Seal's Hole	2017		391	782

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
N/A	Cove Bay	2017		1,323	2,646
N/A	Cove to Hare Ness	2017		361	722
N/A	Inchcolm	2022		75	150
N/A	Strathlethan Bay	2021		61*	61
N/A	Newtonhill - May Craig	2017		298	596
N/A	Perthumie Bay 1	2017		79	158
N/A	Doonie Point to Hall Bay	2017		2	4
N/A	Seal's Cove to Findon Ness	2017		285	570
N/A	Burn of Daff to Newtonhill	2017		790	1,580
N/A	Black Slough to Burn of Daff	2017		303	606
N/A	Yellow Ark	2017		122	244
N/A	Darn Bay	2017		10	20
N/A	Little John's Haven	2017		6	12
N/A	Kineff	2017		111	222
N/A	Whistleberry	2017		43	86
N/A	Swirl Cove	2017		83*	83
N/A	Rouen Bay	2017		174	348
N/A	The Slainges	2017		967	1,934
N/A	Findon Ness to Black Slough	2017		80	160
N/A	Inchkeith	2022		471	942
N/A	Covesea	2019		560	1,120

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
N/A	Portknockie	2018		31	62
N/A	South Sutor (2-6)	2021		53	106
N/A	North Sutor of Cromarty/ Castlecreaig	2021		289	578
N/A	The Altar-Quindry	2021		34	68
N/A	Holm 4	2021		23	46
N/A	Grid Square HY2112	2021		6	12
N/A	Shapinsay 8	2021		13	26
N/A	Quindry - Hoxa- Dam of Hoxa	2021		1	2
N/A	HOY 22	2019		33	66
N/A	Rothiesholm Head 2	2019		49	98
N/A	Rerwick Head 2	2019		3	6
N/A	Deerness 10	2019		5	10
N/A	Burgh Head 1	2018		21*	21
N/A	Carlin Geo 1	2018		188*	188
N/A	Brough of Birsay	2018		1	2
N/A	Gultak	2018		14	28
N/A	Row Head	2018		1	2
N/A	Eynhallow	2018		38	76
N/A	Costa Head	2018		52	104

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
N/A	Muckle Green Holm	2018		32	64
N/A	Trumland RSPB	2018		127	254
N/A	Starrie Geo	2017		51	102
N/A	Shapinsay 9	2016		4	8
N/A	Windwick- Burwick	2016		16	32
N/A	Stenness	2019		65	130
N/A	HU 3066	2021		2	4
N/A	Staraster to Shaabers Head	2017		21	42
N/A	Brough Skerries to Corn Head	2021		1*	1
N/A	The Kamer to Bay of Garth	2021		4	8
N/A	Neap of Norby to the Kamer	2021		19	38
N/A	Treawick to Burrier Head	2019		3	6
N/A	Dogs Head to treawick	2019		8	16
N/A	Point of Hus to Hevdigarth	2016		10	20
N/A	Vaila	2016		44	88
N/A	Burga Stacks to Caves	2016		1	2
N/A	West of the Nev - Stead of Culswick	2016		27	54
N/A	Westerwick to West of the Nev	2016		50	100

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
N/A	Scarvister to West Mouli Geo	2016		13	26
N/A	The Ord	2019		46	92
N/A	Whale wick to sandwick	2016		29	58
N/A	West burra	2014		65	130
N/A	Kettlaness	2014		36	72
N/A	South Havra	2016		5	10
N/A	Ness of Ireland	2014		42	84
N/A	Griskerry to Taing of Maywick	2016		22	44
N/A	Noness	2021		38	76
N/A	St Ninian's Isle	2018		39	78
N/A	Hich Holm	2017		28	56
N/A	Troswick Ness	2021		20	40
N/A	Troswick beach to Boddam	2021		21	42
N/A	Corbie Geo to Whale stack	2016		1	2
N/A	Broad stack to Stack of Barons geo	2021		47	94
N/A	Grutness Pier to Greystane Geo	2021		43	86
N/A	Geo of Parks to Jarlshof	2021		147	294

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (AON/AOS)	Breeding Individuals
N/A	Horse Island	2021		12	24
N/A	Sandwood Bay Stack	2021		26*	26
N/A	Faraid Head 3	2021		182	364
N/A	Faraid Head 4	2021		116	232
N/A	Eilean Iosal	2021		141*	141
N/A	Cleit An t-Seabhaig	2019		50*	50
N/A	Faraid Head 2	2019		30	60
N/A	Am Balg	2019		148	296
N/A	Rubha Thormaid	2019		50*	50
Coquet Island SPA	Coquet Island SPA	2021		466	932
N/A	Howick	2019		640	1,280
N/A	Cullernose Point	2019		92	184
N/A	Dunstanburgh Castle	2019		336	672
N/A	Seahouses	2019		206	412
N/A	Farne Islands	2019		4402	8,804
N/A	Old Hall Bay to Castle Haven	2018		267	534
N/A	South Sutor	2015		66	132
	Regional Breeding population				**212,798**

*Counts of individuals, **Counts from Swann (2016) SNH report, ***Counts from Swann (2018) SNH report.

Table 14. Breeding colony counts for gannet.

SPA	Sub-colony	Date	SMP Database Counts (AON)	Breeding Individuals
Forth Islands	N/A	2014	75,259	150,518
St. Abb's Head to Fast Castle	N/A	2021	4	8
Troup, Pennan and Lion's Head	N/A	2019	4,825	9,650
Fair Isle	N/A	2021	4,971	9,942
Foula	N/A	2021	2,443	4,886
West Westray	Noup Cliffs	2021	1,384	2,768
Marwick Head	N/A	2021	9	18
Sule Skerry	Sule Skerry	2018	4,515	9,030
Sule Stack	Sule Stack	2013	4,550	9,100
Noss	N/A	2019	13,765	27,530
North Rona and Sula Sgeir	N/A	2013	11,230	22,460
Hermaness, Saxa Vord and Valla Field	N/A	2014	25,580	51,160
Flamborough & Filey Coast	N/A	2017	13,392	26,784
St. Kilda	N/A	2013	60,290	120,580
	Regional Breeding Population			**444,434**

Table 15. Breeding colony counts for guillemot.

SPA	Sub-colony	Date	SPA total individuals taken from SMP database (plus correction factor)	SMP Database Counts (IND)	Breeding Individuals[1]
Buchan Ness to Collieston Coast	N/A	2016/2017	33,632 (45,067)	33,632***	45,067
Troup, Pennan and Lion's Head	Aberdour Bay	2017	23,801 (31,893)	2,187	2,931
Troup, Pennan and Lion's Head	Pennan Head	2017		1,449	1,942
Troup, Pennan and Lion's Head	Troup & Lion's Head RSPB	2017		18,853	25,263
Troup, Pennan and Lion's Head	Crovie to Collie Head	2017		1,137	1,524
Troup, Pennan and Lion's Head	More Head - Crovie Pier	2017		175	235
East Caithness Cliffs	N/A	2016	149,248 (199,992)	149,248*	199,992
North Caithness Cliffs	N/A	2018	38,863 (52,076)	38,863**	52,076
Fair Isle	N/A	2021	14,906 (19,974)	14,906	19,974
Copinsay	N/A	2015	18,454 (24,728)	18,454	24,728
Pentland Firth Islands	N/A	2021	6 (8)	6	8
N/A	Staxigoe	2018		9‡	18

SPA	Sub-colony	Date	SPA total individuals taken from SMP database (plus correction factor)	SMP Database Counts (IND)	Breeding Individuals[1]
N/A	Noss Head	2018		107‡	214
	Regional Breeding Population				**373,971**

[1]applying Harris et al., (2015) correction factor x 1.34 for total adult breeding numbers, *Counts from Swann (2016) SNH report, **Counts from Swann (2018) SNH report, ***Counts from Inch Cape Scoping Opinion(2017), ‡AON counts multiplied by 2.

Table 16. Breeding colony counts for razorbill.

SPA	Sub-colony	Date	SPA total individuals taken from SMP database (plus correction factor)	SMP Database Counts (IND)	Breeding Individuals[1]
Buchan Ness to Collieston Coast	N/A	2019	5,813 (7,789)	5,813	7,789
Troup, Pennan and Lion's Head	West Quarry Head	2017	4,518 (6,054)	3	4
Troup, Pennan and Lion's Head	Aberdour Bay	2017		379	508
Troup, Pennan and Lion's Head	Troup and Lion's Head RSPB	2017		2,762	3,701

SPA	Sub-colony	Date	SPA total individuals taken from SMP database (plus correction factor)	SMP Database Counts (IND)	Breeding Individuals[1]
Troup, Pennan and Lion's Head	Pennan Head	2017		442	592
Troup, Pennan and Lion's Head	Crovie to Collie Head	2017		839	1,124
Troup, Pennan and Lion's Head	More Head - Crovie Pier	2017		93	125
N/A	Head of Garness	2017		81	109
N/A	Redhythe Point	2017		30	40
N/A	Garron Point	2017		16	21
N/A	Greg Ness - Seals Hole	2017		1	1
N/A	Cove Bay	2017		145	194
N/A	Cove to Hare Ness	2017		151	202
N/A	Hare Ness to Seal's cove	2017		254	340
N/A	Sands of Forvie	2019		148	198
Pentland Firth Islands	Pentland Firth Islands	2021	382 (512)	382	512
Fair Isle	N/A	2021	1,217 (1,631)	1,217	1,631
East Caithness Cliffs SPA	N/A	2016	30,042 (40,256)	30,042*	40,256
North Caithness Cliffs SPA	N/A	2016	3,503 (4,694)	3,503**	4,694
Copinsay	Copinsay	2015	581 (777)	525	704

SPA	Sub-colony	Date	SPA total individuals taken from SMP database (plus correction factor)	SMP Database Counts (IND)	Breeding Individuals[1]
Copinsay	Corn Holm	2015		14	19
Copinsay	Ward Holm	2015		32	43
Copinsay	Black Holm	2015		10	13
N/A	Burwick - Sandwick	2016		16	21
N/A	Windwick-Burwick	2021		96	129
N/A	Horse of Copinsay	2015		92	123
	Regional Breeding Population				**63,095**

[1]applying Harris et al., (2015) correction factor x 1.34 for total adult breeding numbers, *Counts from Swann (2016) SNH report, **Counts from Swann (2018) SNH report.

Table 17. Breeding colony counts for puffin.

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
East Caithness Cliffs	N/A	2016	189	189*	189
North Caithness Cliffs	N/A	2016	3,053	3,053**	3,053
Hoy	Hoy RSPB reserve	2017	361	178	178
Hoy	Old Man of Hoy to Rora	2017		4	4
Hoy	HOY 5	2017		2	2
Hoy	HOY 7	2017		94	94

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
Hoy	HOY 8	2017		78	78
Hoy	HOY 17	2016		4	4
Hoy	HOY 29	2017		1	1
Fair Isle	N/A	2015	6,666	6,666	6,666
Forth Islands	The Lamb	2021		777***	1,554
Forth Islands	Bass Rock	2018		685***	1,370
Forth Islands	Craigleith	2018	10,229	2,640***	5,280
Forth Islands	Fidra	2018		1,000***	2,000
Forth Islands	Inchmickery RSPB	2022		25	25
Noss	N/A	2017	1,174	1,174	1,174
Sule Skerry and Sule Stack	N/A	2018	95,484	47,742***	95,484
Cape Wrath	Clo Mor 8	2018		255	255
Cape Wrath	Clo Mor 9	2018		1,509	1,509
Cape Wrath	Clo Mor 10	2018	2,244	360	360
Cape Wrath	Clo Mor 11	2018		110	110
Cape Wrath	Cape Wrath 4	2018		10	10
Foula	N/A	2016	6,351	6,351	6,351
Buchan Ness to Collieston Coast	N/A	2019	170	170	170
Troup, Pennan and Lion's head	Pennan Head	2017	30	21	21
Troup, Pennan and Lion's head	Troup and Lion's Head RSPB	2017		9	9

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
Fowlsheugh	Tremuda/ Old Hall Bay	2018	61	4	4
Fowlsheugh	Fowlsheugh RSPB	2018		23***	46
Fowlsheugh	Swallow Cove- Crawton	2018		7	7
Fowlsheugh	Thornyhive	2018		4	4
North Rona and Sula Sgeir	North Rona	2021	2,286	2,232	2,232
North Rona and Sula Sgeir	Sula Sgeir	2021		54	54
Pentland Firth Islands	Muckle Skerry	2016	4,546	1,984***	3,968
Pentland Firth Islands	Swona	2016		289***	578
Copinsay	Copinsay	2016	1,204	493***	986
Copinsay	Ward Holm	2015		210	210
Copinsay	Black Holm	2015		8	8
Auskerry	N/A	2016	446	223***	446
Rousay	Rousay 1	2016	101	1	1
Rousay	Rousay 2	2016		3	3
Rousay	Rousay 4	2016		45	45
Rousay	Rousay 5	2016		8	8
Rousay	Rousay 6	2018		10	10
Rousay	Rousay 7	2016		10	10
Rousay	Rousay 8	2016		1	1
Rousay	Rousay 11	2016		12	12
Rousay	Rousay 12	2016		9	9
Rousay	Rousay 13	2016		2	2

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
West Westray	West Westray 7	2017	70	7	7
West Westray	West Westray 6	2017		11	11
West Westray	West Westray 5	2017		8	8
West Westray	West Westray 1	2017		1	1
West Westray	Noup Cliffs RSPB	2017		17	17
North Hill and Holm	North Hill RSPB	2019	26	26	26
Noss	N/A	2017	1,174	1,174	1,174
Sumburgh Head	Grutness Pier to Greystane Geo	2021	1	1	1
N/A	Isle of May	2017	78,400	39,200***	78,400
N/A	Whiting Ness to Ethie Haven 8	2018		3	3
N/A	Whiting Ness to Ethie Haven 7	2018		6	6
N/A	Auchmithie	2018		5	5
N/A	Whiting Ness to Ethie Haven 4	2018		6	6
N/A	Garron Point	2017		16***	32
N/A	Ushat Head 1	2016		4	4
N/A	St John's Point	2015		5	5
N/A	Stroma Island	2016		17	17
N/A	Hare Ness to Seal's cove	2017		7	7
N/A	Inchcolm	2021		10	10

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
N/A	Seal's Cove to Findon Ness	2017		7	7
N/A	Findon Ness to Black Slough	2015		2	2
N/A	Black Slough to Burn of Daff	2017		2	2
N/A	Newtonhill - May Craig	2017		3	3
N/A	Doonie Point to Hall Bay	2017		1	1
N/A	Old Hall Bay- Castle Haven	2018		1	1
N/A	The Slainges	2017		5	5
N/A	Rounen Bay	2017		2	2
N/A	Whistleberry	2017		3	3
N/A	Inchkeith	2019		1,010	1,010
N/A	Windwick to Burwick	2016		7	7
N/A	The Altar - Quindry	2021		16	16
N/A	Hoxa Head	2016		1	1
N/A	HOY 06 - tysties	2016		2	2
N/A	HOY 04 - tysties	2016		1	1
N/A	HOY 05 - tysties	2016		1	1
N/A	HOY 03 - tysties	2016		5	5
N/A	South Walls	2016		1	1
N/A	HOY 01 - tysties	2016		25	25
N/A	HOY 02 - tysties	2016		63	63

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
N/A	Switha	2019		21	21
N/A	Flotta 6	2019		4	4
N/A	Flotta 5	2019		2	2
N/A	Cava	2018		1***	2
N/A	Deerness 4	2016		1	1
N/A	Mull Head	2018		2	2
N/A	Shapinsay 9	2016		6	6
N/A	Shapinsay 10	2016		3***	6
N/A	Grid square HY2217	2018		5	5
N/A	Grid square HY2221	2018		1***	2
N/A	Burgh Head 2	2018		1	1
N/A	Muckle Green Holm	2018		33	33
N/A	Marwick Head	2016		1	1
N/A	Brough of Birsay	2017		5	5
N/A	Skipi Geo to Whitaloo Point	2021		3	3
N/A	Whitaloo Point to Loop of Cruie	2021		35	35
N/A	Costa Head	2018		19	19
N/A	Costa Hill Cliffs	2018		4***	8
N/A	Eynhallow	2018		26	26
N/A	Sunday 5	2017		8	8
N/A	Calf of Eday	2018		1	1
N/A	Eday 4	2018		1	1

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
N/A	Eday 5	2018		39	39
N/A	Eday 6	2018		1	1
N/A	Eday 20	2018		6	6
N/A	Castle of Burrian	2016		271	271
N/A	Westray 6	2016		56	56
N/A	Holm of Papa Westray	2019		4	4
N/A	Papa Westray 1 - Tysties	2016		25	25
N/A	Vaila	2016		45	45
N/A	Little Loch to Eswick Holm	2017		4	4
N/A	Hoo Stack	2017		3	3
N/A	Burga Stacks to Caves	2016		7	7
N/A	Giltarump Stack	2016		1	1
N/A	West of the New - Stead of Culswick	2016		8	8
N/A	Westerwick to West of the Nev	2016		3	3
N/A	The Nev	2017		1	1
N/A	Sanda Stour	2017		1	1
N/A	Cheynies	2017		1	1
N/A	Oxna	2017		4	4
N/A	Ness of Setter to Broch of Burraland	2021		5	5
N/A	Geos of the Veng	2019		1	1

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
N/A	Bannaminn to Croo Geo	2016		2	2
N/A	South havra	2016		10	10
N/A	Taing of Maywick to Maywick Bay	2016		1	1
N/A	Maywick to Holms Geo	2016		5	5
N/A	Griskerry to Taing of Maywick	2016		40	40
N/A	Quinni Geo o Boats Noost	2017		8	8
N/A	St Ninian's Isle	2016		34	34
N/A	Hich Holm	2016		8	8
N/A	Colsay	2016		93	93
N/A	Cloki Stack to Peerie Voe	2016		2	2
N/A	Whale Stack to Cloki Stack	2016		8	8
N/A	Kame to Corbie geo	2017		5	5
N/A	Stack o' da Noup to Kame	2017		8	8
N/A	Stack o da Noup	2016		28	28
N/A	Scarfi Taing to Noup o' Noss	2017		36	36
N/A	Landvillas to Scarfi Taing	2017		7	7
N/A	Faraid Head 2	2019		5	5
N/A	Faraid Head 3	2021		1	1

SPA	Sub-colony	Date	SPA total individuals	SMP Database Counts (IND)	Breeding Individuals
N/A	Faraid Head 4	2021		54	54
N/A	Faraid Head 5	2018		10	10
N/A	Eilean nan Ron while island	2021		2	2
N/A	Strathy 1	2016		15	15
					216,364

*Counts from Swann (2016) SNH report, **Counts from Swann (2018) SNH report, *** AON counts multiplied by 2.

4.2 HRA Apportionment methodology

The method statement explaining how apportionment of potential impacts to individual features of specific SPAs is calculated is presented within the **Green Volt Report to Inform Appropriate Assessment, Annex 2: HRA Apportionment Annex**. The method statement contains a table with the final apportionment rates for each species associated with any specific designated site (**Table 2**). For the breeding season apportionment, these values are calculated using sabbatical rates, rates of immatures/ adults and values from the SNH Apportionment tool (SNH, 2018). Sabbatical rates and immature rates are provided in **Table 1** of the **Green Volt Report to Inform Appropriate Assessment, Annex 2: HRA Apportionment Annex**. The values from the SNH apportionment tool (SNH, 2018) can be found in **Table 18** to **Table 22** of this report. For SPAs that have more than one sub-colony contributing to their overall number, the totals of the sub-colonies are added together to provide a single value for the apportionment towards the SPA.

In order to provide clarity on how apportionment rates were calculated for the breeding season, an example can be found below for guillemots apportioned to Buchan Ness to Collieston Coast SPA:

*Proportion of adults * Proportion of non-sabbaticals*Proportion apportioned to SPA*

*60.65% * 93.00% * 33% = 18.4%*

This final value of 18.4% is the value that is presented within the **Green Volt HRA Apportionment Technical Annex Table 2**.

Table 18. Kittiwake apportionment results following the SNH apportionment guidance (SNH, 2018).

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Coquet Island SPA	Coquet Island	932	289	83,579	130,967	0.461	2.168	0.003	0.001	0.001
N/A	Howick	1,280	277	76,674	132,842	0.468	2.137	0.005	0.002	0.002
N/A	Cullernose Point	184	276	76,176	132,586	0.467	2.141	0.001	<0.001	<0.001
N/A	Dunstanburgh castle	672	273	74,529	133,161	0.469	2.132	0.003	0.001	0.001
N/A	Seahouses	412	264	69,432	134,020	0.472	2.118	0.002	0.001	0.001
Farne Islands SPA	Farne Islands SPA	8,804	258	66,667	135,268	0.477	2.099	0.038	0.016	0.016
N/A	Eyemouth to Burnmouth 1	120	244	59,390	124,543	0.439	2.279	0.001	<0.001	<0.001
N/A	Eyemouth to Burnmouth 2	342	242	58,758	127,326	0.449	2.230	0.002	0.001	0.001
N/A	Eyemouth to Burnmouth 3	12	242	58,709	125,957	0.444	2.254	0.000	<0.001	<0.001
N/A	Eyemouth to Burnmouth 4	124	242	58,685	126,959	0.447	2.236	0.001	<0.001	<0.001
N/A	Eyemouth to Burnmouth 5	228	242	58,564	126,990	0.447	2.235	0.001	0.001	0.001
N/A	Eyemouth to Burnmouth 6	316	242	58,467	127,409	0.449	2.228	0.002	0.001	0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Eyemouth to Burnmouth 7	276	242	58,371	127,290	0.448	2.230	0.001	0.001	0.001
Forth Islands SPA	Bass Rock (Forth Islands SPA)	1,138	236	55,460	112,409	0.396	2.525	0.007	0.003	0.02
	Craigleith (Forth Islands SPA)	244	236	55,507	108,433	0.382	2.618	0.002	0.001	
	The Lamb (Forth Islands SPA)	4	240	57,504	107,387	0.378	2.643	0.000	<0.001	
	Fidra (Forth Islands SPA)	744	241	57,936	106,876	0.376	2.656	0.005	0.002	
	Isle of May (Forth Islands SPA)	5,032	223	49,506	119,123	0.420	2.383	0.033	0.014	
N/A	Inchkeith	942	257	65,792	88,068	0.310	3.223	0.006	0.003	0.003
N/A	Inchcolm	150	263	69,169	85,003	0.299	3.340	0.001	<0.001	<0.001
N/A	Whiting Ness to Ethie Haven 1	500	188	35,344	127,052	0.448	2.234	0.004	0.002	0.002
N/A	Whiting Ness to Ethie Haven 4	820	185	34,336	128,969	0.454	2.201	0.007	0.003	0.003
N/A	Auchmithie	7	184	33,966	129,757	0.457	2.188	0.000	<0.001	<0.001
N/A	Yellow Ark	244	151	22,771	144,088	0.508	1.970	0.003	0.001	0.001
N/A	Darn bay	20	151	22,771	144,085	0.508	1.970	0.000	<0.001	<0.001
N/A	Little John's Haven	12	150	22,410	146,993	0.518	1.931	0.000	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Kineff	222	149	22,290	148,421	0.523	1.913	0.003	0.001	0.001
N/A	Whistleberry	86	149	22,082	149,038	0.525	1.905	0.001	<0.001	<0.001
N/A	Swirl Cove	83	148	21,993	148,362	0.523	1.913	0.001	<0.001	<0.001
N/A	Rouen Bay	348	148	21,845	147,138	0.518	1.929	0.004	0.002	0.002
N/A	The Slainges	1,934	147	21,550	149,967	0.528	1.893	0.023	0.01	0.01
Fowlsheugh SPA	Swallow Cove (Fowlsheugh SPA)	4,312	145	21,141	149,540	0.527	1.898	0.053	0.023	0.148
	Fowlsheugh RSPB (Fowlsheugh SPA)	18,888	144	20,707	151,306	0.533	1.876	0.232	0.099	
	Thronyhive Bay (Fowlsheugh SPA)	3,342	143	20,306	152,290	0.536	1.864	0.042	0.018	
	Tremuda/ Old Hall Bay (Fowlsheugh SPA)	1,536	142	20,278	152,925	0.539	1.856	0.019	0.008	
Handa SPA	Handa	5,150	315	98,910	184,303	0.649	1.540	0.011	0.005	0.005
N/A	Rothiesholm Head 2	98	181	32,580	228,708	0.806	1.241	0.001	<0.001	<0.001
Sule Skerry and Sule Stack SPA	Sule Skerry and Sule Stack	100	173	30,033	226,483	0.798	1.253	0.001	<0.001	<0.001
N/A	Burgh Head 1	21	175	30,660	225,634	0.795	1.258	0.000	<0.001	<0.001
N/A	Carlin Geo 1	188	175	30,730	226,333	0.797	1.254	0.001	<0.001	<0.001
N/A	Sandwood Bay Stack	26	296	87,734	197,697	0.696	1.436	0.000	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Am Balg	296	295	87,143	200,309	0.706	1.417	0.001	<0.001	<0.001
N/A	Buckiemill	740	178	31,613	133,056	0.469	2.134	0.007	0.003	0.003
St Abb's Head to Fast Castle SPA	St Abbs Head to Fast Castle SPA	9,200	238	56,644	124,608	0.439	2.278	0.050	0.022	0.022
N/A	Old Hall Bay - Castle haven	534	141	19,937	152,886	0.539	1.857	0.007	0.003	0.003
N/A	Strathlethan Bay	61	140	19,656	152,462	0.537	1.862	0.001	<0.001	<0.001
N/A	Perthumie Bay 1	158	136	18,360	153,568	0.541	1.849	0.002	0.001	0.001
N/A	Donnie Point - Hall Bay	4	134	18,010	154,629	0.545	1.836	0.000	<0.001	<0.001
N/A	Newtonhill - May Craig	596	132	17,345	157,980	0.557	1.797	0.008	0.004	0.004
N/A	Burn of Daff to Newtonhill	1,580	130	17,004	157,822	0.556	1.799	0.023	0.01	0.01
N/A	Black Slough to Burn of Daff	606	128	16,358	156,805	0.552	1.810	0.009	0.004	0.004
N/A	Findon Ness to Black Slough	160	127	16,028	159,648	0.562	1.778	0.002	0.001	0.001
N/A	Seal's Cove to Findon Ness	570	126	15,901	159,021	0.560	1.785	0.009	0.004	0.004

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Hare Ness to Seal's Cove	1,624	124	15,475	159,413	0.562	1.781	0.025	0.011	0.011
N/A	Cove to Hare Ness	722	124	15,252	158,545	0.559	1.791	0.012	0.005	0.005
N/A	Cove Bay	2,646	122	14,933	161,314	0.568	1.760	0.042	0.018	0.018
N/A	Greg Ness - Seals Hole	782	120	14,376	163,061	0.574	1.741	0.013	0.006	0.006
Ythan Estuary, Sadns of Forvie and Meikle Loch SPA	Ythan Estuary, Sadns of Forvie and Meikle Loch SPA	774	104	10,712	171,094	0.603	1.659	0.016	0.007	0.007
Buchan Ness to Collieston Coast SPA	Buchan Ness to Colliston Coast	22,590	90	8,154	182,715	0.644	1.554	0.584	0.25	0.25
N/A	Peterhead South Harbour	66	82	6,740	188,092	0.663	1.509	0.002	0.001	0.001
N/A	Fraserburgh Harbour	162	85	7,191	192,184	0.677	1.477	0.005	0.002	0.002
N/A	West Quarry head (Troup, Pennan and Lion's Head SPA)	2	97	9,370	181,211	0.638	1.567	0.000	<0.000	<0.000

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Troup, Pennan and Lion's Head SPA	Aberdour Bay (Troup, Pennan and Lion's Head SPA)	4,786	98	9,683	181,271	0.639	1.566	0.105	0.045	0.188
	Pennan Head (Troup, Pennan and Lion's Head SPA)	1,110	100	10,020	181,992	0.641	1.560	0.023	0.01	
	Troup & Lion's Head RSPB (Troup, Pennan and Lion's Head SPA)	13,594	103	10,568	180,440	0.636	1.573	0.275	0.118	
	Crovie to Collie Head (Troup, Pennan and Lion's Head SPA)	1,516	104	10,816	177,584	0.626	1.599	0.030	0.013	
	More Head - Crovie Pier (Troup, Pennan and Lion's Head SPA)	224	106	11,278	178,242	0.628	1.593	0.004	0.002	
N/A	Snow Craig	50	109	11,925	173,947	0.613	1.632	0.001	<0.001	<0.001
N/A	Head of Garness	6	111	12,343	175,710	0.619	1.616	0.000	<0.001	<0.001
N/A	Redhythe Point	440	128	16,358	162,326	0.572	1.749	0.006	0.003	0.003
N/A	Garron Point	434	129	16,512	165,849	0.584	1.712	0.006	0.003	0.003
N/A	Findlater	158	129	16,667	164,054	0.578	1.730	0.002	0.001	0.001
N/A	Portknockie	62	135	18,225	162,224	0.571	1.750	0.001	<0.001	<0.001
N/A	Covesea	1,120	167	27,989	135,665	0.478	2.092	0.011	0.005	0.005

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	South Sutor All (2-6)	106	203	41,047	109,446	0.386	2.594	0.001	<0.001	<0.001
N/A	South Sutor 3	132	202	40,844	109,625	0.386	2.590	0.001	<0.001	<0.001
N/A	North Sutor of Cromarty/Castlecraig	578	202	40,844	109,831	0.387	2.585	0.005	0.002	0.002
East Caithness Cliffs SPA	East Caithness Cliffs SPA	48,920	174	30,380	158,099	0.557	1.796	0.392	0.168	0.168
North Caithness Cliffs SPA	North Caithness Cliffs SPA	11,136	186	34,447	217,205	0.765	1.307	0.057	0.025	0.025
N/A	Noss Head	90	157	24,743	204,614	0.721	1.387	0.001	<0.001	<0.001
N/A	Eilean Iosal	141	244	59,536	206,578	0.728	1.374	0.000	<0.001	<0.001
N/A	Rubha Thormaid	50	251	63,051	206,239	0.727	1.376	0.000	<0.001	<0.001
N/A	Cleit An t-Seabhaig	50	254	64,618	210,037	0.740	1.352	0.000	<0.001	<0.001
N/A	Faraid Head 4	232	268	71,610	211,973	0.747	1.339	0.001	<0.001	<0.001
N/A	Faraid Head 3	364	267	71,289	211,982	0.747	1.339	0.001	<0.001	<0.001
N/A	Faraid Head 2	60	267	71,449	212,148	0.747	1.338	0.000	<0.001	<0.001
Cape Wrath SPA	Clo Mor 5 (Cape Wrath SPA)	78	273	74,256	210,334	0.741	1.350	0.000	<0.001	0.007
	Clo Mor 7 (Cape Wrath SPA)	700	274	74,857	213,434	0.752	1.330	0.002	0.001	

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
	Clo Mor 8 (Cape Wrath SPA)	1,812	275	75,350	213,232	0.751	1.331	0.004	0.002	
	Clo Mor 9 (Cape Wrath SPA)	3,266	275	75,570	213,753	0.753	1.328	0.008	0.003	
	Clo Mor 10 (Cape Wrath SPA)	658	277	76,508	214,358	0.755	1.324	0.002	0.001	
	Clo mor 11 (Cape Wrath SPA)	340	277	76,729	212,123	0.747	1.338	0.001	<0.001	
	Cape Wrath 4 (Cape Wrath SPA)	362	280	78,400	215,681	0.760	1.316	0.001	<0.001	
Noss SPA	Noss	154	253	63,857	273,994	0.965	1.036	0.000	<0.001	<0.001
Fair Isle SPA	Fair Isle	646	193	37,172	257,602	0.907	1.102	0.003	0.001	0.001
Sumburgh Head SPA	Sumburgh Head	482	223.5	49,952	267,212	0.941	1.062	0.001	0.001	0.001
	Grutness Pier to Greystane Geo	294	223.5	49952.25	267,095	0.941	1.062	0.001	<0.001	
	Geo of Parks to Jarlshof	86	226.3	51211.69	267,367	0.942	1.062	0.000	<0.001	
	Sandwick to Virkie	2	226.3	51211.69	267,368	0.942	1.062	0.000	<0.001	
N/A	Horse Island	24	223	49,774	266,727	0.940	1.064	0.000	<0.001	<0.001
N/A	Stenness	130	299	89,102	275,647	0.971	1.030	0.000	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Staraster to Shabbers Head	42	287	82,484	274,464	0.967	1.034	0.000	<0.001	<0.001
N/A	Brough Skerries to Corn Head	1	282	79,524	274,131	0.966	1.036	0.000	<0.001	<0.001
N/A	HU 3066	4	294	86,260	275,343	0.970	1.031	0.000	<0.001	<0.001
N/A	The Kramer to Bay of Garth	8	281	79,130	274,121	0.966	1.036	0.000	<0.001	<0.001
Papa Stour SPA	Papa Stour	50	281	78,792	274,237	0.966	1.035	0.000	<0.001	<0.001
N/A	Vaila	88	265	70,066	272,561	0.960	1.042	0.000	<0.001	<0.001
N/A	Point of Hus to Hevdigarth	20	267	71,182	272,516	0.960	1.042	0.000	<0.001	<0.001
N/A	Burga Stacks to Caves	2	262	68,382	272,263	0.959	1.043	0.000	<0.001	<0.001
N/A	Dogs Head to Treawick	16	270	72,630	240,252	0.846	1.182	0.000	<0.001	<0.001
N/A	Scarvister to West Mouli Geo	26	259	67,081	272,329	0.959	1.042	0.000	<0.001	<0.001
N/A	Kettlaness	72	246	60,516	270,443	0.953	1.050	0.000	<0.001	<0.001
N/A	Noness	76	237	56,264	270,136	0.952	1.051	0.000	<0.001	<0.001
N/A	Ness of Ireland	84	241	58,081	270,129	0.952	1.051	0.000	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Griskerry to Taing of Maywick	44	239	57,312	269,389	0.949	1.054	0.000	<0.001	<0.001
N/A	South Havra	10	244	59,390	270,031	0.951	1.051	0.000	<0.001	<0.001
N/A	West Burra	130	248	61,554	270,784	0.954	1.048	0.000	<0.001	<0.001
N/A	Whale Wick to Sandwick	58	249	62,101	271,071	0.955	1.047	0.000	<0.001	<0.001
N/A	Treawick to Burrier Head	6	270	72,900	272,842	0.961	1.040	0.000	<0.001	<0.001
N/A	Westerwick to West of the Neb	100	259	67,288	272,179	0.959	1.043	0.000	<0.001	<0.001
N/A	West of the Nev - Stead of Culswick	54	259	67,185	272,067	0.958	1.043	0.000	<0.001	<0.001
N/A	The Ord	92	250	62,500	273,021	0.962	1.040	0.000	<0.001	<0.001
N/A	Neap of Norby to the Kramer	38	280	78,624	274,069	0.965	1.036	0.000	<0.001	<0.001
N/A	St Ninian's Isle	78	238	56,739	269,033	0.948	1.055	0.000	<0.001	<0.001
N/A	Hich Holm	56	238	56,549	268,914	0.947	1.056	0.000	<0.001	<0.001
N/A	Troswick Ness	40	233	54,382	268,981	0.948	1.055	0.000	<0.001	<0.001
N/A	Troswick Beach to Boddam	42	232	53,685	268,717	0.947	1.056	0.000	<0.001	<0.001
N/A	Geo of Parks to Jarlshof	294	224	49,952	267,095	0.941	1.063	0.001	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Grutness Pier to Greystane Geo	86	226	51,212	267,367	0.942	1.062	0.000	<0.001	<0.001
N/A	Broad Stack to Stack of Barons Geo	94	228	51,984	267,127	0.941	1.063	0.000	<0.001	<0.001
N/A	Corbie Geo to Whale Stack	2	234	54,803	268,207	0.945	1.058	0.000	<0.001	<0.001
Foula SPA	Foula	850	265	70,013	268,972	0.948	1.055	0.002	0.001	0.001
Hoy SPA	Old Man of Hoy to Rora	58	266	70,543	268,973	0.948	1.055	0.000	<0.001	0.001
	HOY 8	18	267	71,076	268,974	0.948	1.055	0.000	<0.001	
	Hoy RSPB Reserve	76	268	71,610	268,975	0.948	1.055	0.000	<0.001	
	HOY 17	456	269	72145.96	268,976	0.948	1.055	0.001	<0.001	
Copinsay SPA	Copinsay	1,910	166	27,423	234,803	0.827	1.209	0.011	0.005	0.005
Rousay SPA	Rousay 1 – RSPB	464	205	42,025	239,532	0.844	1.185	0.002	0.001	0.001
	Rousay 4	4	205	42,025	239,533	0.844	1.185	0.000	<0.001	
	Rousay 7	12	205	42,025	239,534	0.844	1.185	0.000	<0.001	
	Rousay 8	12	205	42,025	239,535	0.844	1.185	0.000	<0.001	
	Rousay 11	108	205	42,025	239,536	0.844	1.185	0.000	<0.001	
	Rousay 12	60	205	42,025	239,537	0.844	1.185	0.000	<0.001	
	West Westray 1	24	213	45,199	242,126	0.853	1.172	0.000	<0.001	0.008
	Noup Cliffs RSPB	3644	214	45,625	242,127	0.853	1.172	0.000	0.005	

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
West Westray SPA	West Westray 5	990	215	46,053	242,128	0.853	1.172	0.000	0.001	
	West Westray 6	852	216	46,483	242,129	0.853	1.172	0.000	0.001	
Calf of Eday SPA	Calf of Eday	24	213	45,199	242,126	0.853	1.172	0.000	<0.001	<0.001
North Hill and Holm SPA	North Hill and Holm	30	216	46,699	244,958	0.863	1.159	0.000	<0.001	<0.001
Marwick Head SPA	Marwick Head SPA	1,812	228	51,802	236,827	0.834	1.199	0.006	0.002	0.002
Pentland Firth Islands SPA	Swona	2	169	28,629	229,176	0.807	1.239	0.000	<0.001	0.001
	Muckle Skerry	352	170	28,968	229,177	0.807	1.239	0.000	0.001	
N/A	Starrie Geo	102	189	35,834	241,531	0.851	1.175	0.000	<0.001	<0.001
N/A	Muckle Green Holm	64	190	35,910	238,825	0.841	1.189	0.000	<0.001	<0.001
N/A	Trumland RSPB	254	198	39,363	238,690	0.841	1.189	0.001	<0.001	<0.001
N/A	Eynhallow	76	205	42,066	238,368	0.840	1.191	0.000	<0.001	<0.001
N/A	Costa Head	104	212	44,817	238,050	0.839	1.193	0.000	<0.001	<0.001
N/A	Brough of Birsay	2	218	47,437	237,346	0.836	1.196	0.000	<0.001	<0.001
N/A	Row Head	2	213	45,156	235,255	0.829	1.207	0.000	<0.001	<0.001
N/A	Grid Square HY2112	12	207	42,890	234,211	0.825	1.212	0.000	<0.001	<0.001
N/A	Shapinsay 9	8	181	32,689	237,110	0.835	1.197	0.000	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
N/A	Shapinsay 8	26	181	32,652	237,066	0.835	1.197	0.000	<0.001	<0.001
N/A	Rerwick Head 2	6	178	31,720	236,345	0.833	1.201	0.000	<0.001	<0.001
N/A	Deerness 10	10	169	28,629	235,334	0.829	1.206	0.000	<0.001	<0.001
N/A	Holm 4	46	193	37,095	234,393	0.826	1.211	0.000	<0.001	<0.001
N/A	Gultak	28	171	29,138	233,858	0.824	1.214	0.000	<0.001	<0.001
N/A	HOY 22	66	181	32,906	229,817	0.810	1.235	0.000	<0.001	<0.001
N/A	The Altar - Quindry	68	175	30,765	231,412	0.815	1.227	0.000	<0.001	<0.001
N/A	Quindry - Hoxa - Dam of Hoxa	2	179	32,113	231,406	0.815	1.227	0.000	<0.001	<0.001
N/A	Windwick to Burwick	32	168	28,190	230,511	0.812	1.232	0.000	<0.001	<0.001
	TOTALS	**212,798**		**7,650,365**			**256.196**	**2.419**	**1.00**	
	Foraging range and foraging area									
	Mean-max + one SD Foraging range (km)		300.6							
	Potential Foraging Range (km^2)		283,875							

Table 19. Guillemot apportionment results following the SNH apportionment guidance (SNH, 2018).

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Buchan Ness to Colliston Coast SPA	Buchan Ness to Colliston Coast	33,632	72	5,227	20,252	0.711	1.406	0.411	0.326	0.326
Troup, Pennan and Lion's Head SPA	Aberdour Bay	2,187	98	9,683	19,814	0.696	1.437	0.015	0.012	0.121
	Pennan Head	1,449	100	10,020	19,591	0.688	1.453	0.010	0.008	
	Troup & Lion's Head RSPB	18,853	103	10,588	19,273	0.677	1.477	0.120	0.095	
	Crovie to Collie Head	1,137	105	11,025	19,164	0.673	1.486	0.007	0.006	
	More Head - Crovie Pier	175	106	11,321	18,849	0.662	1.511	0.001	0.001	
East Caithness Cliffs SPA	East Caithness Cliffs SPA	149,248	174	30,380	11,309	0.397	2.518	0.563	0.446	0.446

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
North Caithness Cliffs SPA	North Caithness Cliffs SPA	38,863	185	34,336	18,908	0.664	1.506	0.078	0.061	0.061
Fair Isle SPA	Fair Isle	14,906	181	32,725	71,498	0.963	1.038	0.022	0.017	0.017
Copinsay SPA	Copinsay	18,454	165	27,258	62,995	0.849	1.178	0.036	0.029	0.029
Pentland Firth Islands SPA	Pentland Firth Islands	6	156	24,242	57,511	0.775	1.290	0.000	<0.001	<0.001
N/A	Staxigoe	18	157	24,586	19,585	0.264	3.789	0.000	<0.001	<0.001
N/A	Noss Head	214	157	24,743	19,305	0.260	3.844	0.002	0.001	0.001
	TOTALS	**278,910**		**206,806**			**16.300**	**1.261**	**1.00**	
	Foraging range and foraging area									
	Mean-max + 1SD Foraging range south of Pentland Firth (km)		95.2							
	Potential Foraging Range (km2)		28,472							

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance²	Area of foraging range as sea (km²)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
	Mean-max + 1SD foraging range north of Pentland Firth (km)		153.7							
	Potential Foraging Range (km2)		74,216							

Table 20. Razorbill apportionment results following the SNH apportionment guidance (SNH, 2018).

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance²	Area of foraging range as sea (km²)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Buchan Ness to Collieston Coast SPA	Buchan Ness to Collieston Coast	5,813	90	8,149	34,738	0.408	2.450	0.326	0.215	0.215
Troup, Pennan and	West Quarry Head	3	97	9,467	29,504	0.347	2.885	0.000	<0.001	
	Aberdour Bay	379	99	9,702	29,388	0.345	2.896	0.021	0.014	0.159

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Lion's Head SPA	Troup and Lion's Head RSPB	2,762	103	10,568	28,098	0.330	3.029	0.148	0.098	
	Pennan Head	442	100	10,020	29,620	0.348	2.874	0.024	0.016	
	Crovie to Collie Head	839	105	11,088	27,686	0.325	3.074	0.043	0.029	
	More Head - Crovie Pier	93	107	11,342	27,085	0.318	3.143	0.005	0.003	
N/A	Head of Garness	81	111	12,343	26,093	0.307	3.262	0.004	0.003	0.003
N/A	Redhythe Point	30	128	16,410	21,788	0.256	3.907	0.001	0.001	0.001
N/A	Garron Point	16	129	16,512	24,043	0.282	3.540	0.001	<0.001	<0.001
N/A	Greg Ness - Seals Hole	1	120	14,376	28,380	0.333	2.999	0.000	<0.001	<0.001
N/A	Cove Bay	145	122	14,933	27,255	0.320	3.123	0.006	0.004	0.004
N/A	Cove to Hare Ness	151	124	15,252	27,595	0.324	3.084	0.006	0.004	0.004
N/A	Hare Ness to Seal's cove	254	124	15,475	27,089	0.318	3.142	0.010	0.006	0.006
N/A	Sands of Forvie	148	104	10,712	29,695	0.349	2.866	0.007	0.005	0.005
Pentland Firth Islands SPA	Pentland Firth Islands	382	172	29,618	65,270	0.767	1.304	0.003	0.002	0.002

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Fair Isle SPA	Fair Isle	1,217	193	37,326	80,750	1.721	0.581	0.004	0.002	0.002
East Caithness Cliffs SPA	East Caithness Cliffs SPA	30,042	172	29,653	18,803	0.221	4.527	0.856	0.565	0.565
North Caithness Cliffs SPA	North Caithness Cliffs SPA	3,503	186	34,410	34,541	0.406	2.464	0.047	0.031	0.031
Copinsay SPA	Copinsay	524	165	27,291	70,799	1.509	0.663	0.002	0.002	0.002
	Corn Holm	14	167	27,822	71,113	1.516	0.660	0.000	<0.001	
	Ward Holm	32	166	27,689	70,269	1.498	0.668	0.000	<0.001	
	Black Holm	10	167	27,956	69,922	1.490	0.671	0.000	<0.001	
N/A	Burwick - Sandwick	16	168	28,325	65,209	1.390	0.719	0.000	<0.001	<0.001
N/A	Windwick-Burwick	96	168	28,224	64,528	1.375	0.727	0.000	<0.001	<0.001
N/A	Horse of Copinsay	92	165	27,357	70,879	1.511	0.662	0.000	<0.001	<0.001
	TOTALS	**47,085**		**538,396**			**61.254**	**1.515**	**1.00**	
	Foraging range and foraging area									
	Mean-max + one SD Foraging range (km) north of Pentland Firth			164.6						

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
	Potential Foraging Range (km^2)			85,116.						
	Mean-max + one SD Foraging range (km) south of Pentland Firth			122.2						
	Potential Foraging Range (km^2)			46,913						

Table 21. Puffin apportionment results following the SNH apportionment guidance (SNH, 2018).

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
East Caithness Cliffs SPA	East Caithness Cliffs	189	155	24,149	164,491	0.743	1.345	0.001	0.001	0.001
North Caithness Cliffs SPA	North Caithness Cliffs	4,091	154	23,839	164,490	0.743	1.345	0.031	0.03	0.03
Hoy SPA	Hoy RSPB reserve	178	177	31,188	176,450	0.797	1.254	0.001	0.001	0.002

	Old Man of Hoy to Rora	4	178	31,542	176,451	0.797	1.254	0.000	<0.001	
	HOY 5	2	179	31,898	176,452	0.797	1.254	0.000	<0.001	
	HOY 7	94	180	32,256	176,453	0.797	1.254	0.000	<0.001	
	HOY 8	78	181	32,616	176,454	0.797	1.254	0.000	<0.001	
	HOY 17	4	182	32,979	176,455	0.797	1.254	0.000	<0.001	
	HOY 29	1	183	33,343	176,456	0.797	1.254	0.000	<0.001	
Fair Isle SPA	Fair Isle	6,666	181	32,725	203,550	0.920	1.087	0.030	0.028	0.028
Forth Islands SPA	The Lamb	1,554	210	44,184	78,797	0.356	2.808	0.013	0.013	0.082
	Bass Rock	1,370	211	44,605	78,798	0.356	2.808	0.012	0.011	
	Craigleith	5,280	212	45,029	78,799	0.356	2.808	0.044	0.042	
	Fidra	2,000	213	45,454	78,800	0.356	2.808	0.017	0.016	
	Inchmickery RSPB	25	214	45,882	78,801	0.356	2.808	0.000	<0.001	
Noss SPA	Noss	1,174	244	59,292	215,651	0.975	1.026	0.003	0.003	0.003
Sule Skerry and Sule Stack SPA	Sule Skerry and Sule Stack	95,448	249	62,001	175,792	0.794	1.259	0.260	0.248	0.248
Cape Wrath SPA	Clo Mor 8	255	251	63,152	159,681	0.722	1.386	0.001	0.001	0.006
	Clo Mor 9	1,509	252	63,655	159,682	0.722	1.386	0.004	0.004	
	Clo Mor 10	360	253	64,161	159,683	0.722	1.386	0.001	0.001	
	Clo Mor 11	110	254	64,668	159,684	0.722	1.386	0.000	<0.001	
	Cape Wrath 4	10	255	65,178	159,685	0.722	1.386	0.000	<0.001	

Foula SPA	Foula	6,351	252	63,706	212,380	0.960	1.042	0.014	0.013	0.013
	Whiting Ness to Ethie Haven 8	3	183	33,562	104,477	0.472	2.118	0.000	<0.001	<0.001
	Whiting Ness to Ethie Haven 7	6	183	33,489	104,269	0.471	2.122	0.000	<0.001	<0.001
	Auchmithie	5	184	33,966	103,265	0.467	2.143	0.000	<0.001	<0.001
	Whiting Ness to Ethie Haven 4	6	185	34,336	102,614	0.464	2.156	0.000	<0.001	<0.001
Buchan Ness to Colliesto n Coast SPA	Buchan Ness to Collieston	170	72	5,227	143,245	0.647	1.545	0.007	0.006	0.006
Troup, Pennan and Lion's Head SPA	Pennan Head	21	87	7,500	143,445	0.648	1.543	0.001	0.001	0.001
	Troup and Lion's Head RSPB	9	88	7,674	143,446	0.648	1.543	0.000	<0.001	
	Garron Point	32	129	16,512	119,017	0.538	1.859	0.000	<0.001	<0.001
	Ushat Head 1	4	198	39,204	160,150	0.724	1.382	0.000	<0.001	<0.001
	Stroma Island	17	171	29,344	169,256	0.765	1.307	0.000	<0.001	<0.001
	Hare Ness to Seal's cove	7	125	15,650	124,898	0.564	1.772	0.000	<0.001	<0.001
	Inchcolm	10	263	69,169	62,167	0.281	3.560	0.000	<0.001	<0.001

	Seal's cove to Findon Ness	7	126	15,901	124,656	0.563	1.775	0.000	<0.001	<0.001
	Findon Ness to Black Slough	2	127	16,028	124,291	0.562	1.780	0.000	<0.001	<0.001
	Black Slough to Burn of Daff	2	128	16,358	123,675	0.559	1.789	0.000	<0.001	<0.001
	Newtonhill - May Craig	3	132	17,345	122,181	0.552	1.811	0.000	<0.001	<0.001
	Doonie Point to Hall Bay	1	134	18,010	121,460	0.549	1.822	0.000	<0.001	<0.001
	Old Hall Bay-Castle Haven	1	141	19,937	118,257	0.534	1.871	0.000	<0.001	<0.001
Fowlsheugh SPA	Fowlsheugh RSPB	4	144	20,707	118,876	0.537	1.861	0.000	<0.001	0.001
	Tremuda/ Old Hall Bay	46	145	20,996	118,877	0.537	1.861	0.001	0.001	
	Swallow Cove-Crawton	7	146	21,287	118,878	0.537	1.861	0.000	<0.001	
	Thornyhive Bay	4	147	21,580	118,879	0.537	1.861	0.000	<0.001	
	The Slainges	5	147	21,550	118,331	0.535	1.870	0.000	<0.001	<0.001
	Rounen Bay	2	148	21,845	118,010	0.533	1.875	0.000	<0.001	<0.001
	Whistleberry	3	149	22,082	117,856	0.533	1.878	0.000	<0.001	<0.001
	Inchkeith	1,010	257	65,792	66,652	0.301	3.320	0.006	0.007	0.007
North Rona and Sula Sgeir	North Rona	5	147	21,550	118,331	0.535	1.870	0.000	0.003	0.003
	Sula Sgeir	2	148	21,845	118,010	0.533	1.875	0.000	<0.001	

Pentland Firth Islands SPA	Muckle Skerry	3	149	22,082	117,856	0.533	1.878	0.000	0.031	0.036
	Swona	1,010	257	65,792	66,652	0.301	3.320	0.007	0.004	
	Windwick to Burwick	2,232	324	104,652	183,150	0.828	1.208	0.003	<0.001	<0.001
	The Altar - Quindry	54	325	105,300	183,151	0.828	1.208	0.000	<0.001	<0.001
	Hoxa Head	3,968	156	24,242	148,849	0.673	1.487	0.033	<0.001	<0.001
	HOY 06 - tysties	578	157	24,555	148,850	0.673	1.487	0.005	<0.001	<0.001
	HOY 04 - tysties	7	168	28,190	150,008	0.678	1.475	0.000	<0.001	<0.001
	HOY 05 - tysties	16	175	30,765	148,420	0.671	1.491	0.000	<0.001	<0.001
	HOY 03 - tysties	1	178	31,648	147,280	0.666	1.502	0.000	<0.001	<0.001
	South Walls	2	186	34,633	162,393	0.734	1.363	0.000	<0.001	<0.001
	HOY 01 - tysties	1	184	33,782	163,462	0.739	1.354	0.000	<0.001	<0.001
	HOY 02 - tysties	1	187	34,932	162,788	0.736	1.359	0.000	<0.001	<0.001
	Switha	5	188	35,231	163,957	0.741	1.350	0.000	<0.001	<0.001
	Flotta 6	1	181	32,725	164,128	0.742	1.348	0.000	<0.001	<0.001
	Flotta 5	25	180	32,508	166,608	0.753	1.328	0.000	<0.001	<0.001
	Cava	63	178	31,648	164,386	0.743	1.346	0.000	<0.001	<0.001
Copinsay SPA	Copinsay SPA	986	166	27,423	177,260	0.801	1.248	0.006	0.006	0.007
	Ward Holm	210	167	27,956	174,958	0.791	1.265	0.001	0.001	
	Black Holm	8	166	27,622	173,519	0.784	1.275	0.000	<0.001	
	Deerness 4	1	176	30,941	173,471	0.784	1.276	0.000	<0.001	<0.001
	Mull Head	2	174	30,137	175,253	0.792	1.263	0.000	<0.001	<0.001
Auskerry SPA	Auskerry SPA	446	166	27,556	172,704	0.780	1.281	0.003	0.003	0.003

	Shapinsay 9	6	181	32,689	183,713	0.830	1.205	0.000	<0.001	<0.001
	Shapinsay 10	6	183	33,416	174,386	0.788	1.269	0.000	<0.001	<0.001
	Grid square HY2217	5	203	41,047	171,443	0.775	1.291	0.000	<0.001	<0.001
	Grid square HY2221	2	208	43,181	171,826	0.776	1.288	0.000	<0.001	<0.001
	Burgh Head 2	1	175	30,485	180,277	0.815	1.227	0.000	<0.001	<0.001
	Muckle Green Holm	33	190	35,910	186,172	0.841	1.189	0.000	<0.001	<0.001
	Marwick Head	1	228	51,802	182,558	0.825	1.212	0.000	<0.001	<0.001
	Brough of Birsay	5	218	47,437	183,540	0.829	1.206	0.000	<0.001	<0.001
	Skipi Geo to Whitaloo Point	3	211	44,521	180,449	0.815	1.226	0.000	<0.001	<0.001
	Whitaloo Point to Loop of Cruie	35	210	44,226	177,782	0.803	1.245	0.000	<0.001	<0.001
	Costa Head	19	212	44,817	184,494	0.834	1.199	0.000	<0.001	<0.001
	Costa Hill Cliffs	8	207	42,808	179,614	0.812	1.232	0.000	<0.001	<0.001
	Eynhallow	26	205	42,066	184,795	0.835	1.197	0.000	<0.001	<0.001
	Rousay SPA	101	191	36,405	185,489	0.838	1.193	0.000	<0.001	<0.001
	Calf of Eday	8	199	39,521	189,832	0.858	1.166	0.000	<0.001	<0.001
	Eday 4	1	196	38,455	183,882	0.831	1.203	0.000	<0.001	<0.001
	Eday 5	1	197	38,612	183,692	0.830	1.205	0.000	<0.001	<0.001
	Eday 6	39	198	39,006	183,662	0.830	1.205	0.000	<0.001	<0.001
	Eday 20	1	194	37,675	183,856	0.831	1.204	0.000	<0.001	<0.001
	Sanday 5	6	191	36,596	187,881	0.849	1.178	0.000	<0.001	<0.001
	Castle of Burrian	271	202	40,602	186,779	0.844	1.185	0.001	0.001	0.001

	West Westray SPA	44	200	40,120	188,720	0.853	1.173	0.000	<0.001	<0.001
	Westray 6	56	212	44,859	183,169	0.828	1.208	0.000	<0.001	<0.001
	Holm of Papa Westray	4	211	44,310	180,644	0.816	1.225	0.000	<0.001	<0.001
	Papa Westray 1 - Tysties	25	213	45,284	183,859	0.831	1.204	0.000	<0.001	<0.001
	North Hill and Holm SPA	26	203	41,006	192,285	0.869	1.151	0.000	<0.001	<0.001
	Vaila	45	265	70,066	214,392	0.969	1.032	0.000	<0.001	<0.001
	Little Loch to Eswick Holm	4	267	71,129	191,595	0.866	1.155	0.000	<0.001	<0.001
	Hoo Stack	3	265	70,384	192,696	0.871	1.148	0.000	<0.001	<0.001
	Burga Stacks to Caves	7	262	68,382	214,331	0.969	1.032	0.000	<0.001	<0.001
	Giltarump Stack	1	259	67,288	178,902	0.808	1.237	0.000	<0.001	<0.001
	West of the New - Stead of Culswick	8	259	67,185	199,821	0.903	1.107	0.000	<0.001	<0.001
	Westerwick to West of the Nev	3	259	67,288	214,368	0.969	1.032	0.000	<0.001	<0.001
	The Nev	1	257	66,203	180,079	0.814	1.229	0.000	<0.001	<0.001
	Sanda Stour	1	257	66,049	180,183	0.814	1.228	0.000	<0.001	<0.001
	Cheynies	1	255	64,923	206,392	0.933	1.072	0.000	<0.001	<0.001
	Oxna	4	253	64,060	180,913	0.818	1.223	0.000	<0.001	<0.001

	Ness of Setter to Broch of Burraland	5	251	62,750	184,737	0.835	1.198	0.000	<0.001	<0.001
	Geos of the Veng	1	249	62,200	200,176	0.905	1.105	0.000	<0.001	<0.001
	Bannaminn to Croo Geo	2	246	60,368	201,556	0.911	1.098	0.000	<0.001	<0.001
	South havra	10	244	59,390	213,749	0.966	1.035	0.000	<0.001	<0.001
	Taing of Maywick to Maywick Bay	1	240	57,408	199,467	0.901	1.109	0.000	<0.001	<0.001
	Maywick to Holms Geo	5	239	57,264	205,518	0.929	1.077	0.000	<0.001	<0.001
	Griskerry to Taing of Maywick	40	239	57,312	213,433	0.965	1.037	0.000	<0.001	<0.001
	Quinni Geo o Boats Noost	8	234	54,803	202,055	0.913	1.095	0.000	<0.001	<0.001
	St Ninian's Isle	34	238	56,739	213,236	0.964	1.038	0.000	<0.001	<0.001
	Hich Holm	8	238	56,549	213,155	0.963	1.038	0.000	<0.001	<0.001
	Colsay	93	234	54,756	204,034	0.922	1.085	0.000	<0.001	<0.001
	Cloki Stack to Peerie Voe	2	232	53,639	204,361	0.924	1.083	0.000	<0.001	<0.001
	Whale Stack to Cloki Stack	8	232	53,917	204,384	0.924	1.083	0.000	<0.001	<0.001
	Kame to Corbie geo	5	234	54,756	204,245	0.923	1.083	0.000	<0.001	<0.001

	Stack o' da Noup to Kame	8	234	54,662	206,640	0.934	1.071	0.000	<0.001	<0.001
	Stack o da Noup	28	231	53,130	201,250	0.909	1.100	0.000	<0.001	<0.001
	Scarfi Taing to Noup o' Noss	36	233	54,289	198,998	0.899	1.112	0.000	<0.001	<0.001
	Landvillas to Scarfi Taing	7	232	53,963	200,864	0.908	1.102	0.000	<0.001	<0.001
Sumburgh Head SPA	Grutness Pier to Greystane Geo	1	214	45,882	210,229	0.950	1.053	0.000	<0.001	<0.001
	Faraid Head 2	5	267	71,449	153,608	0.694	1.441	0.000	<0.001	<0.001
	Faraid Head 3	1	267	71,289	153,174	0.692	1.445	0.000	<0.001	<0.001
	Faraid Head 4	54	232	53,824	153,478	0.694	1.442	0.000	<0.001	<0.001
	Faraid Head 5	10	255	64,821	152,734	0.690	1.449	0.000	<0.001	<0.001
	Eilean nan Ron while island	2	231	53,500	153,754	0.695	1.439	0.000	<0.001	<0.001
	Strathy 1	15	210	44,184	153,270	0.693	1.444	0.000	<0.001	<0.001
	Dunnet Head 3	1,223	183	33,416	160,599	0.726	1.378	0.007	0.006	0.006
	Dunnet Head 4	222	185	34,188	160,621	0.726	1.378	0.001	0.001	0.001
	Dunnet Head 5	126	184	33,709	160,428	0.725	1.379	0.001	0.001	0.001
	Melvich 2	1,112	204	41,534	150,425	0.680	1.471	0.005	0.005	0.005
	Melvich 3	62	205	42,107	149,880	0.677	1.476	0.000	<0.001	<0.001
	Melvich 4	123	208	43,222	149,838	0.677	1.477	0.001	0.001	0.001
	Dunnet Head 1	33	184	33,856	159,679	0.722	1.386	0.000	<0.001	<0.001
	Stacks of Duncansby	2	165	27,258	162,700	0.735	1.360	0.000	<0.001	<0.001

	Duncansby Head	2	166	27,456	163,821	0.740	1.351	0.000	<0.001	<0.001
	Sandside Head 1	3	201	40,361	149,204	0.674	1.483	0.000	<0.001	<0.001
	Sandside Head 2	6	203	41,168	149,303	0.675	1.482	0.000	<0.001	<0.001
	Melvich 1	48	204	41,534	149,507	0.676	1.480	0.000	<0.001	<0.001
	Holburn Head 2	42	191	36,443	157,565	0.712	1.404	0.000	<0.001	<0.001
	Holburn Head 3	11	191	36,596	157,677	0.713	1.403	0.000	<0.001	<0.001
	Ness of Litter	7	194	37,558	157,561	0.712	1.404	0.000	<0.001	<0.001
	Isle of May	78,400	223	49,729	88,815	0.401	2.492	0.535	0.503	0.503
Rousay SPA	Rousay 1	1	202	40,885	174,465	0.788	1.268	0.000	<0.001	<0.000
	Rousay 2	3	203	41,290	174,628	0.789	1.267	0.000	<0.001	
	Rousay 4	45	204	41,657	175,070	0.791	1.264	0.000	<0.001	
	Rousay 5	8	203	41,250	175,390	0.793	1.262	0.000	<0.001	
	Rousay 6	10	206	42,230	175,002	0.791	1.264	0.000	<0.001	
	Rousay 7	10	205	41,820	175,481	0.793	1.261	0.000	<0.001	
	Rousay 8	1	205	42,025	175,486	0.793	1.261	0.000	<0.001	
	Rousay 11	12	201	40,280	175,710	0.794	1.259	0.000	<0.001	
	Rousay 12	9	198	39,323	175,529	0.793	1.261	0.000	<0.001	
	Rousay 13	2	199	39,681	175,774	0.794	1.259	0.000	<0.001	
West Westray SPA	West westray 7	7	210	44,184	187,035	0.845	1.183	0.000	<0.001	<0.000
	West westray 6	11	210	44,184	187,763	0.849	1.179	0.000	<0.001	
	West westray 5	8	215	46,268	188,162	0.850	1.176	0.000	<0.001	
	West westray 1	1	214	45,967	188,465	0.852	1.174	0.000	<0.001	
	Noup Cliffs RSPB	17	215	46,182	188,650	0.853	1.173	0.000	<0.001	
	TOTALS	**219,543**		**7,028,766**			**234.97**	**1.065**	**1.00**	

	Foraging range and foraging area		
	Mean-max + one SD Foraging Range (km)	265.4	
	Potential Foraging Range (km^2)	221,285	

Table 22. Gannet apportionment results following the SNH apportionment guidance (SNH, 2018).

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance ^{2}	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Forth Islands SPA	Forth Islands	150,518	238	56,406	498,515	0.456	2.194	0.751	0.563	0.563
St. Abb's Head to Fast Castle SPA	St. Abb's Head NNR	8	238	56,644	366,919	0.450	2.222	0.000	<0.001	<0.001
Troup, Pennan and Lion's Head SPA	Troup & Lion's Head RSPB	9,650	100	10,080	551,912	0.677	1.477	0.181	0.136	0.136
Fair Isle SPA	Fair Isle	9,942	193	37,172	678,652	0.832	1.201	0.041	0.031	0.031
Foula SPA	Foula*	4,886	265	70,013	709,431	0.870	1.149	0.010	0.008	0.008
West Westray SPA	Noup Cliffs RSPB	2,768	213	45,199	706,773	0.867	1.153	0.009	0.007	0.007
Marwick Head SPA	Marwick Head	18	210	44,184	700,535	0.859	1.164	0.000	<0.001	<0.001

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance ^{2}	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
Sule Skerry and Sule Stack SPA	Sule Skerry	9,030	259	66,822	693,149	0.850	1.176	0.020	0.015	
	Sule Stack	9,100	261	67,912	692,795	0.850	1.177	0.020	0.015	0.030
Noss SPA	Noss	27,530	253	63,908	641,817	0.787	1.270	0.070	0.053	0.053
North Rona and Sula Sgeir SPA	North Rona and Sula Sgeir	22,460	344	118,130	702,379	0.862	1.161	0.028	0.021	0.021
Hermaness, Saxa Vord and Valla Field	Hermaness, Saxa Vord and Valla Field	51,160	329	108,044	700,336	0.859	1.164	0.071	0.053	0.053
Flamborough & Filey Coast	Flamborough & Filey Coast	26,784	415	171,893	354,011	0.434	2.303	0.046	0.035	0.035
St. Kilda	St. Kilda	120,580	475	225,435	1,287,129	0.815	1.227	0.084	0.063	0.063
	TOTALS	**444,434**		**21,141,842**			**20.037**	**1.332**	**1.00**	
	Foraging range and foraging area									
	Mean-max + one SD foraging range (km)	509.4								
	Max forage range Forth Islands (km)	590								
	Max forage range St Kilda	709								
	Max forage range Grassholm	516.7								

SPA	Colony Name	Count of adult birds at colony (individuals)	Distance to Project Site (km)	Distance [2]	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion	Total proportion
	Potential Foraging Range (km^2)		815,207							
	Potential Foraging Range forth Islands (km^2)		1,093,588							
	Potential Foraging Range St Kilda (km^2)		1,579,219							
	Potential Foraging Range Grassholm (km^2)		838,739							

4.3 CRM apportioned impacts

Since the Project's application was submitted, updated evidence as well as new bird guidance (Nature Scot, 2023) for use in CRMs has been published. These updates have since been considered and applied by the Applicant and the results for the re-runs of CRM can be found in **Section 3** of this report (for both the Applicant's Approach and the SNCB's Approach). As a consequence of the updated results, the apportioned impacts for CRM have also been updated and can be found in **Table 23** -**Table 26**. These represent updates to the tables and results in the Project's application documents within **Section 7.4.2** of the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment**.

Table 23. Apportionment of potential kittiwake collision risk mortality values from the project in the UK North Sea using the Applicant's Approach.

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
Buchan Ness to Collieston Coast SPA	15.55%	2.40%	1.81%	0.6	0	0.1	0.7	60,904	22,590	0.01/ 0.02%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.02%
Troup, Pennan and Lion's Head SPA	11.66%	2.85%	2.15%	0.4	0.1	0.1	0.6	63,200	21,232	<0.00/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.02%
Fowlsheugh SPA	9.20%	1.78%	1.35%	0.4	0	0	0.4	73,300	28,078	<0.00/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
East Caithness Cliffs SPA	10.44%	7.72%	5.84%	0.4	0.2	0.2	0.7	65,000	48,920	<0.00/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
North Caithness Cliffs SPA	1.53%	1.94%	1.47%	0.1	0	0	0.1	26,200	11,136	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
Copinsay SPA	0.30%	0.13%	0.10%	0	0	0	0	19,100	1,910	<0.00/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
Forth Islands SPA	1.23%	0.59%	0.45%	0.1	0	0	0.1	16,800	7,702	<0.00/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
Hoy SPA	0.07%	0.08%	0.06%	0	0	0	0	6,000	608	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
St Abb's Head to Fast Castle SPA	1.34%	0.65%	0.49%	0.1	0	0	0.1	42,340	9,200	<0.00/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
Fair Isle SPA	0.07%	0.15%	0.11%	0	0	0	0	36,320	646	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
Calf of Eday SPA	0.03%	0.14%	0.11%	0	0	0	0	3,434	284	<0.00/ 0.00%	<0.00/ 0.01%	>0.00/ 0.01%	<0.00/ 0.01%

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
Rousay SPA	0.07%	0.34%	0.26%	0	0	0	0	9,800	660	<0.00/ 0.00%	<0.00/ 0.01%	<0.00/ 0.01%	<0.00/ 0.01%
Marwick Head SPA	0.15%	0.10%	0.08%	0	0	0	0	15,400	1,812	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%
West Westray SPA	0.52%	2.30%	1.74%	0	0.1	0.1	0.1	47,800	5,510	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.01%
Farne Islands SPA	1.00%	0.66%	0.50%	0.1	0	0	0.1	8,667	8,804	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
Cape Wrath SPA	0.46%	0.10%	0.02%	0	0	0	0	19,400	7,216	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%
Sumburgh Head SPA	0.07%	0.04%	0.03%	0	0	0	0	2,732	864	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%
Handa SPA	0.29%	0.01%	0.00%	0	0	0	0	21,464	5,150	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%
Coquet Island SPA	0.09%	0.09%	0.07%	0	0	0	0	426	932	<0.01/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
Noss SPA	0.01%	0.10%	0.07%	0	0	0	0	14,040	154	<0.00/ 0.00%	<0.00/ 0.01%	0.00/ 0.01%	<0.00/ 0.02%
Foula SPA	0.05%	0.06%	0.05%	0	0	0	0	7,680	850	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%
Flamborough and Filey Coast SPA	N/A	7.19%	5.44%	0	0.2	0.1	0.2	89,040	91,008	0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%	<0.00/ 0.00%

Table 24. Apportionment of potential kittiwake collision risk mortality values from the project in the UK North Sea using the SNCB's Approach.

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
Buchan Ness to Collieston Coast SPA	15.55%	2.40%	1.81%	0.8 – 0.9	0.1 – 0.1	0.1 – 0.1	1.0 – 1.1	60,904	22,590	0.01/ 0.03 – 0.01/ 0.03%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.03 – 0.01/ 0.03%
Troup, Pennan and Lion's Head SPA	11.66%	2.85%	2.15%	0.6 – 0.7	0.1 – 0.1	0.1 – 0.1	0.8 – 0.9	63,200	21,232	0.01/ 0.02 – 0.01/ 0.02%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.03 – 0.01/ 0.03%
Fowlsheugh SPA	9.20%	1.78%	1.35%	0.5 – 0.5	0.1 – 0.1	0.1 – 0.1	0.6 – 0.7	73,300	28,078	<0.00/ 0.01 – 0.01/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.02 – 0.01/ 0.02%
East Caithness Cliffs SPA	10.44%	7.72%	5.84%	0.6 – 0.6	0.2 – 0.3	0.3 – 0.4	1.1 – 1.3	65,000	48,920	0.01/ 0.01 – 0.01/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.02 – 0.01/ 0.02%
North Caithness Cliffs SPA	1.53%	1.94%	1.47%	0.1 – 0.1	0.1 – 0.1	0.1 – 0.1	0.2 – 0.3	26,200	11,136	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.01 – 0.01/ 0.02%
Copinsay SPA	0.30%	0.13%	0.10%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	19,100	1,910	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – <0.00/ 0.01%
Forth Islands SPA	1.23%	0.59%	0.45%	0.1 – 0.1	0.0 – 0.0	0.0 – 0.0	0.1 – 0.1	16,800	7,702	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.01 – 0.01/ 0.01%
Hoy SPA SPA	0.07%	0.08%	0.06%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	6,000	608	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – <0.00/ 0.01%

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
St Abb's Head to Fast Castle SPA	1.34%	0.65%	0.49%	0.1 – 0.1	0.0 – 0.0	0.0 – 0.0	0.1 – 0.2	42,340	9,200	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – 0.00/ 0.01%
Fair Isle SPA	0.07%	0.15%	0.11%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	36,320	646	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.01%	<0.00/ 0.01 – 0.00/ 0.02%
Calf of Eday SPA	0.03%	0.14%	0.11%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	3,434	284	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.02 – 0.00/ 0.03%
Rousay SPA	0.07%	0.34%	0.26%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	9,800	660	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.02 – 0.00/ 0.03%
Marwick Head SPA	0.15%	0.10%	0.08%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	15,400	1,812	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – 0.00/ 0.01%
West Westray SPA	0.52%	2.30%	1.74%	0.0 – 0.0	0.1 – 0.1	0.1 – 0.1	0.2 – 0.2	47,800	5,510	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.01 – <0.00/ 0.01%	<0.00/ 0.01 – 0.00/ 0.01%	<0.00/ 0.02 – 0.00/ 0.02%
Farne Islands SPA	1.00%	0.66%	0.50%	0.1 – 0.1	0.0 – 0.0	0.0 – 0.0	0.1 – 0.1	8,667	8,804	0.01/ 0.01 – 0.01/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	0.01/ 0.01 – 0.01/ 0.01%
Cape Wrath SPA	0.46%	0.10%	0.02%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	19,400	7,216	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
Sumburgh Head SPA	0.07%	0.04%	0.03%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	2,732	864	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – 0.00/ 0.01%
Handa SPA	0.29%	0.01%	0.00%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	21,464	5,150	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%
Coquet Island SPA	0.09%	0.09%	0.07%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	426	932	0.01/ 0.01 – 0.01/ 0.01%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.01/ 0.00%	0.02/ 0.01 – 0.02/ 0.01%
Noss SPA	0.01%	0.10%	0.07%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	14,040	154	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – 0.00/ 0.01%	0.00/ 0.01 – 0.00/ 0.02%	<0.00/ 0.02 – 0.00/ 0.03%
Foula SPA	0.05%	0.06%	0.05%	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	0.0 – 0.0	7,680	850	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.01 – 0.00/ 0.01%
Flamborough and Filey Coast SPA	N/A	7.19%	5.44%	0.0 – 0.0	0.2 – 0.2	0.2 – 0.3	0.4 – 0.5	89,040	91,008	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%	<0.00/ 0.00 – 0.00/ 0.00%

Table 25.Apportionment of potential gannet collision risk mortality values from the project in the UK North Sea using the Applicant's Approach.

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
Troup, Pennan and Lion's Head SPA	8.21%	2.72%	1.48%	1.1	0.1	0	1.2	5,574	9,650	0.25/ 0.14%	0.01/ 0.01%	<0.00/ 0.00%	0.26/ 0.15%
Fair Isle SPA	1.87%	2.53%	1.38%	0.3	0	0	0.3	2,332	9,942	0.13/ 0.03%	0.03/ 0.01%	<0.00/ 0.00%	0.16/ 0.04%
Sule Skerry and Sule Stack SPA	1.84%	0.38%	0.20%	0.2	0	0	0.3	11,800	18,130	0.03/ 0.02%	<0.00/ 0.00%	<0.00/ 0.00%	0.03/ 0.02%
Noss SPA	3.18%	6.29%	3.42%	0.4	0.1	0	0.6	13,720	27,530	0.04/ 0.02%	0.01/ 0.01%	<0.00/ 0.00%	0.05/ 0.03%
North Rona and Sula Sgeir SPA	1.28%	0.74%	0.40%	0.2	0	0	0.2	20,800	22,460	0.01/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
Hermaness, Saxa Vord and Valla Field SPA	3.20%	15.69%	8.54%	0.4	0.3	0	0.8	32,800	51,160	0.02/ 0.01%	0.01/ 0.01%	<0.00/ 0.00%	0.03/ 0.02%
Flamborough and Filey Coast SPA	2.08%	8.91%	4.85%	0.3	0.2	0	0.5	16,938	26,784	0.02/ 0.01%	0.01/ 0.01%	<0.00/ 0.00%	0.03/ 0.02%
St Kilda SPA	3.81%	4.80%	2.61%	0.5	0.1	0	0.6	100,100	60,290	0.01/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
Forth Islands SPA	33.90%	44.67%	24.32%	4.6	0.9	0.1	5.5	43,200	150,518	0.13/ 0.04%	0.02/ 0.01%	<0.00/ 0.00%	0.16/ 0.05%

Table 26. Apportionment of potential gannet collision risk mortality values from the project in the UK North Sea using the SNCB's Approach.

SPA	SPA population as a percentage of North Sea (%)			Proportioned collision mortality (breeding adults per annum)				SPA population (breeding adults)		SPA population baseline mortality rate percentage increase using citation/ latest count population (%)			
	Breeding	Pre-breeding	Post-breeding	Breeding	Pre-breeding	Post-breeding	Annual	Citation	Latest count	Breeding	Pre-breeding	Post-breeding	Annual
Troup, Pennan and Lion's Head SPA	8.21%	2.72%	1.48%	1.2	0.1	0	1.3	5,574	9,650	0.27/ 0.16%	0.01/ 0.01%	<0.00/ 0.00%	0.29/ 0.17%
Fair Isle SPA	1.87%	2.53%	1.38%	0.3	0.1	0	0.3	2,332	9,942	0.15/ 0.03%	0.03/ 0.01%	<0.00/ 0.00%	0.18/ 0.04%
Sule Skerry and Sule Stack SPA	1.84%	0.38%	0.20%	0.3	0	0	0.3	11,800	18,130	0.03/ 0.02%	<0.00/ 0.00%	<0.00/ 0.00%	0.03/ 0.02%
Noss SPA	3.18%	6.29%	3.42%	0.5	0.1	0	0.6	13,720	27,530	0.04/ 0.02%	0.01/ 0.01%	<0.00/ 0.00%	0.06/ 0.03%
North Rona and Sula Sgeir SPA	1.28%	0.74%	0.40%	0.2	0	0	0.2	20,800	22,460	0.01/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
Hermaness, Saxa Vord and Valla Field SPA	3.20%	15.69%	8.54%	0.5	0.4	0	0.9	32,800	51,160	0.02/ 0.01%	0.01/ 0.01%	<0.00/ 0.00%	0.03/ 0.02%
Flamborough and Filey Coast SPA	2.08%	8.91%	4.85%	0.3	0.2	0	0.5	16,938	26,784	0.02/ 0.01%	0.01/ 0.01%	<0.00/ 0.00%	0.04/ 0.02%
St Kilda SPA	3.81%	4.80%	2.61%	0.6	0.1	0	0.7	100,100	60,290	0.01/ 0.01%	<0.00/ 0.00%	<0.00/ 0.00%	0.01/ 0.01%
Forth Islands SPA	33.90%	44.67%	24.32%	5.1	1	0.1	6.2	43,200	150,518	0.15/ 0.04%	0.03/ 0.01%	<0.00/ 0.00%	0.18/ 0.05%

5. Assessment for considering population level consequences from impacts of collision and distributional responses (displacement)

The potential for disturbance and displacement to result in an Adverse Effect on Site Integrity (AEoSI) during the operational and maintenance phase of the Project relates to the relevant designated sites and features as considered in the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment, Section 7.4.1.** Consideration and assessment are required where appropriate for the Project alone or in combination with other plans and projects in order to determine if an AEoSI for any given feature of a designated site.

Impacts for displacement have been assessed using both the Applicant's Approach, with evidence in support of this approach described in full in the **Offshore EIA Report Chapter 12, Section 12.11.1** and the SNCB's Approach, which follows the NatureScot's Bird Guidance Note 8 (NatureScot, 2023b). **Table 27** summarises the two approaches taken.

Table 27. Displacement and mortality rates used in the assessments.

Species	Applicant's Approach		SNCB's Approach	
	Breeding	**Non-Breeding**	**Breeding**	**Non-Breeding**
Guillemot	50%/1%	50%/1%	60%/3-5%	60%/1-3%
Razorbill	50%/1%	50%/1%	60%/3-5%	60%/1-3%
Puffin	50%/1%	50%/1%	60%/3-5%	60%/1-3%
Gannet	40-60%/1%	60-80%/1%	70%/1-3%	70%/1-3%
Kittiwake	30%/1-3%	30%/1-3%	30%/1-3%	30%/1-3%

Impacts for collision have been assessed using both the Applicant's Approach and the SNCB's Approach, which are described in full in **Section 3.1** and summarised in **Table 2**.

Assessments for combining impacts from collision and displacement for gannet and kittiwake have not incorporated macro-avoidance following NatureScot advice (**Table 1**, item 21). The Applicant raised concerns that not incorporating any level of macro-avoidance, to account for reduced densities in CRM as a consequence of displacement, would result in considerable over-inflation of predicted mortality. The Applicant advocates the use of a 70% macro-avoidance rate for gannet, in line with other UK SNCB's (Natural England and NRW) and as reasoned in the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment, Section 7.4.4.**

5.1 Revised assessment of predicted impacts to sites and features

In line with NatureScot's consultation comments (see **Table 1** item 4), predicted impacts for designated sites and features have been reviewed following NatureScot's Bird Guidance Note 11 (NatureScot, 2023c), which stipulates that PVA should be undertaken when a 0.02 percentage point change in survival threshold is reached.

The method taken by the Applicant to calculate the percentage point change in survival, as a consequence of estimated impacts from the Project, in accordance with NatureScot's guidance is provided below. Two examples are provided:

Example 1 (using project alone impacts on guillemot at Buchan Ness to Collieston Coast SPA)

Predicted guillemot mortalities, as a result of being displaced from the Green Volt windfarm site plus 2 km buffer, apportioned to Buchan Ness to Collieston Coast SPA are as follows using the Applicant's approach (50% displacement and 1% mortality):

- Breeding season; 4.1 breeding adults; and
- Non-breeding season; 1.0 breeding adults.

Therefore, the annual predicted consequent mortality is 5.1 breeding adults (as determined in the **Green Volt Offshore Windfarm, Report to Inform Appropriate Assessment (2023)**, p132, para. 402).

Metrics used in the calculation for Example 1

a) The annual adult mortality rate for guillemot taken from Horswill and Robinson (2015) is 6.1% (equivalent to an annual survival rate of 93.9%).
b) The latest colony count at Buchan Ness to Collieston Coast SPA is 45,067 breeding individuals.
c) Annual baseline mortality; 45,067 x 0.061 = 2,749 birds.
d) NatureScot guidance (NatureScot, 2023c) states the threshold for PVA is:

> "*where the assessed effects exceed a change to the adult annual survival rate of 0.02 percentage point change. For example, if a survival rate was estimated at 80% and this decreased to 79.98%*"

e) For guillemot, therefore, the threshold would be triggered when annual survival rate decreases to 93.88%, or (equivalently) annual mortality rate increases to 6.12% or more.
f) An annual mortality rate of 6.12% would equal 45,067 x 0.0612 = 2,758 birds per year.
g) This is an increase of 9 birds over the baseline morality of 2,749 birds per year (as shown in (c) above).
h) The threshold increase in mortality may also be calculated as 45,067 x 0.0002 = 9.0 additional mortalities per year.
i) An additional 5.1 mortalities increases the total mortality to 2,749 + 5.1 = 2,754.1 mortalities per year.
j) This gives a total annual mortality rate of (2,754.1/45,067) x 100 = 6.111%
k) This is an increase of 0.011 percentage points over the baseline mortality rate of 6.1%

This clearly indicates that when applying the Applicant's preferred method to estimate displacement mortality for guillemot the additional annual mortality of 5.1 birds would not meet or exceed a 0.02 percentage point change in survival.

Percentage point change in survival on an annual basis.

The Applicant's predicted annual additional mortality for guillemot is 5.1 birds.

Change in survival is equal to;

- Baseline mortality + additional mortality 2,749 + 5.1 = 2,754.1
- Total mortality rate; (2,754.1/45,067) x 100 = 6.111%

Percentage Point Change is 6.111 - 6.1 = 0.011

Example 2 (using project alone impacts on puffin at Sule Skerry and Sule Stack SPA)

Predicted puffin mortalities, as a result of being displaced from the Green Volt windfarm site plus 2 km buffer, apportioned to Sule Skerry and Sule Stack SPA are as follows using the SNCB's approach (breeding season 60% displacement and 3-5% mortality and non-breeding season 60% displacement and 1-3% mortality):

- Beeding season: 0.9 to 1.4 breeding adults.
- Non-breeding season: 0 breeding adults.

Therefore, the annual predicted consequent mortality is 0.9 to 1.4 breeding adults (as determined in the **Green Volt Offshore Windfarm, Report to Inform Appropriate Assessment (2023)**, p190-91, **Table 7.49 and 7.50**).

Metrics used in the calculation for Example 2

a) The annual adult mortality rate for puffin taken from Horswill and Robinson (2015) is 9.4% (equivalent to an annual survival rate of 90.6%).
b) The latest colony count at Sule Skerry and Sule Stack SPA is 95,484 breeding individuals.
c) Annual baseline mortality; 95,484 x 0.094 = 8,975.5 birds
d) Annual 0.02 percentage point change threshold i.e., when annual survival rate decreases to 90.58% or (equivalently) annual mortality rate increases to 9.42% or more.
e) An annual mortality rate of 9.42% would equal 95,484 x 0.0942 = 8,994.6 birds per year.
f) This is an increase of 19.1 birds over the baseline mortality of 8,975.5 birds per year (as shown in (c) above).
g) The threshold increase in mortality may also be calculated as: 95,484 x 0.0002 = 19.1 birds

This clearly indicates that when applying the SNCB's method to estimate displacement mortality for puffin the additional annual mortality of 0.9 to 1.4 birds would not meet or exceed a 0.02 percentage point change in survival, being considerably lower than 19.1 birds.

Percentage point change in survival on an annual basis.

The SNCB's predicted annual additional mortality for puffin is 0.9 to 1.4 birds

Lower estimate: annual additional mortality 0.9 birds

Change in survival is equal to; baseline mortality + additional mortality 8,975.5 + 0.9 = 8,976.4

New mortality rate: (8,976.4 /95,484) x 100 = 9.4009%

9.4009 – 9.4 = 0.0009 percentage point change

Upper estimate: annual additional mortality 1.4 birds

Change in survival is equal to; baseline mortality + additional mortality 8,975.5 + 1.4 = 8,976.9

New mortality rate: (8,976.9 /95,484) x 100 = 9.4014%

9.4014 – 9.4 = 0.0014 percentage point change.

Tables of impacts on features from different designated sites within this Report, are provided for all relevant metrics to show how the threshold for undertaking PVA was calculated using;

- The Applicant's original approach within the Project's application following an 'increase in baseline mortality' with a threshold of 1%; and
- The SNCB's Approach of following a 'percentage point change in survival' with a threshold of 0.02 percentage points.

When thresholds are reached for significant metrics, they are shown in bold and highlighted in yellow, which includes the above mentioned PVA threshold metrics and annual apportioned consequent mortality' of one bird or more.

5.2 Project Alone Impact

Impacts from the Project alone are provided for displacement response, collision and combined impacts for relevant species, using the Applicant's Approach (**Table 28**, **Table 29** and **Table 30**) and SNCB's Approach (**Table 31**, **Table 32** and **Table 33**), to features of designated sites as listed in the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment, Section 7.4.1 and 7.4.2**. The values for the annual apportioned consequent mortality from displacement for each feature and designated site are as calculated in the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment, Section 7.4.1.** The values for the annual apportioned consequent mortality from collision for each feature and designated site were reassessed as stated in **Section 3** and apportioned as shown in the Tables presented in **Section 4.3**.

5.2.1 Project alone impacts using Applicant's approach

Table 28. Project alone predicted impacts from displacement response when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA									
Guillemot	6.1	**5.1**	45067	2749	27.5	9.0	0.19	0.011	No
Kittiwake	14.6	0.1 to 0.3	22590	3298	33.0	4.52	0.003 to 0.01	0.0004 to 0.001	No
Troup, Pennan and Lion's Head SPA									
Guillemot	6.1	**2.3**	31893	1945	19.5	6.38	0.12	0.007	No
Razorbill	10.5	0.2	6054	636	6.4	1.21	0.03	0.003	No
Kittiwake	14.6	0.08 to 0.24	21232	3100	31.0	4.25	0.002 to 0.01	0.0003 to 0.001	No
Gannet	8.1	0.05 to 0.01	9650	782	7.8	1.93	0.01 to 0.02	0.001 to 0.002	No
Fowlsheugh SPA									
Guillemot	6.1	**2.4**	93570	5708	57.1	18.71	0.04	0.003	No
Razorbill	10.5	0.001	18844	1979	19.8	3.77	0.00	0.000005	No
Kittiwake	14.6	0.06 to 0.18	28078	4099	41.0	5.62	0.001 to 0.004	0.0002 to 0.001	No
East Caithness Cliffs SPA									
Guillemot	6.1	**13**	199992	12200	122.0	40.00	0.11	0.007	No
Razorbill	10.5	0.71	40256	4227	42.3	8.05	0.02	0.002	No
Kittiwake	14.6	0.1 to 0.3	48920	7142	71.4	9.78	0.001 to 0.004	0.0002 to 0.001	No
North Caithness Cliffs SPA									
Guillemot	6.1	**4**	52,076	3177	31.8	10.4	0.13	0.008	No

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Razorbill	10.5	0.04	4,694	493	4.9	0.9	0.01	0.001	No
Puffin	9.4	0.01	3,053	287	2.9	0.6	0.003	0.0003	No
Kittiwake	14.6	0.01 to 0.03	11136	1626	16.3	2.2	0.0006 to 0.001	0.00008 to 0.0002	No
Forth Islands SPA									
Puffin	9.4	0.15	10,229	962	9.6	2.0	0.02	0.001	No
Kittiwake	14.6	0.01 to 0.03	7162	1046	10.5	1.4	0.001 - 0.003	0.0001 - 0.0004	No
Gannet	8.1	0.3 to 0.5	150,518	12192	121.9	30.1	0.002 to 0.003	0.0002 to 0.0003	No
Copinsay SPA									
Guillemot	6.1	0.8	24,728	1508	15.1	4.9	0.05	0.003	No
Kittiwake	14.6	0.00 to 0.01	1910	279	2.8	0.4	0.000 to 0.004	0.000 to 0.001	No
Hoy SPA									
Puffin	9.4	0.01	361	34	0.3	0.1	0.03	0.003	No
Kittiwake	14.6	0.001 to 0.002	608	89	0.9	0.1	0.001 to 0.002	0.0002 - 0.0003	No
St Abb's Head to Fast Castle SPA									
Kittiwake	14.6	0.01 to 0.03	9200	1343	13.4	1.8	0.001 to 0.002	0.0001 - 0.0004	No
Fair Isle SPA									
Puffin	9.4	0.03	6666	627	6.3	1.3	0.004	0.0004	No
Kittiwake	14.6	0.001 to 0.004	646	94	0.9	0.1	0.001 to 0.004	0.0002 - 0.0006	No
Gannet	8.1	0.02 to 0.03	9942	805	8.1	2.0	0.002 to 0.003	0.0002 to 0.0003	No
Calf of Eday SPA									
Kittiwake	14.6	0.001 to 0.003	284	41	0.4	0.1	0.002 - 0.007	0.0004 - 0.0011	No
Rousay SPA									

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Kittiwake	14.6	0.002 to 0.007	660	96	1.0	0.1	0.002 - 0.007	0.0003 - 0.0011	No
Marwick Head SPA									
Kittiwake	14.6	0.001 to 0.004	1812	265	2.6	0.4	0.0004 - 0.0015	0.0001 - 0.0002	No
West Westray SPA									
Kittiwake	14.6	0.02 to 0.05	5510	804	8.0	1.1	0.002 - 0.006	0.0003 - 0.0009	No
Farne Islands SPA									
Guillemot	6.1	**3**	85,816	5235	52.3	17.2	0.06	0.003	No
Puffin	9.4	0.04	87,504	8225	82.3	17.5	0.00	0.00005	No
Kittiwake	14.6	0.009 to 0.028	8804	1285	12.9	1.8	0.001 - 0.002	0.0001 to 0.0003	No
Cape Wrath SPA									
Puffin	9.4	0.01	2,244	211	2.1	0.4	0.00	0.0004	No
Kittiwake	14.6	0.003 to 0.008	7216	1054	10.5	1.4	0.0003 - 0.0008	0.00004 - 0.00011	No
Sumburgh Head SPA									
Kittiwake	14.6	0.001 to 0.002	864	126	1.3	0.2	0.0007 to 0.001	0.0001 to 0.0002	No
Handa SPA									
Kittiwake	14.6	0.002 to 0.005	5150	752	7.5	1.0	0.0002 to 0.0006	0.00003 to 0.00009	No
Sule Skerry and Sule Stack SPA									
Puffin	9.4	0.2	95484	8975	89.8	19.1	0.00	0.0003	No
Gannet	8.1	0.01 to 0.01	18130	1469	14.7	3.6	0.0006 to 0.0006	0.00005 to 0.00005	No
Coquet Island SPA									
Puffin	9.4	0.01	50,058	4705	47.1	10.0	0.00	0.00002	No
Kittiwake	14.6	0.001 to 0.003	932	136	1.4	0.2	0.0007 to 0.002	0.0001 to 0.0003	No

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Noss SPA									
Puffin	9.4	0.003	1,174	110	1.1	0.2	0.00	0.0003	No
Kittiwake	14.6	0.001 to 0.002	154	22	0.2	0.0	0.004 to 0.01	0.0006 to 0.001	No
Gannet	8.1	0.04 to 0.05	27,530	2230	22.3	5.5	0.001 to 0.002	0.0001 to 0.0002	No
Foula SPA									
Puffin	9.4	0.02	6351	597	6.0	1.3	0.00	0.0003	No
Kittiwake	14.6	0.001 to 0.002	850	124	1.2	0.2	0.0008 to 0.001	0.0001 to 0.0002	No
North Rona and Sula Sgeir SPA									
Gannet	8.1	0.01 to 0.01	22,460	1819	18.2	4.5	0.0005 to 0.0005	0.00004 to 0.00004	No
Hermaness, Saxa Vord and Valla Field SPA									
Gannet	8.1	0.07 to 0.1	51,160	4144	41.4	10.2	0.001 to 0.002	0.0001 to 0.0002	No
Flamborough and Filey Coast SPA									
Guillemot	6.1	**3.6**	121,754	7427	74.3	24.4	0.05	0.003	No
Razorbill	10.5	0.003	40506	4253	42.5	8.1	0.00	0.000007	No
Kittiwake	14.6	0.04 - 0.13	91008	13287	132.9	18.2	0.0003 to 0.0009	0.00004 to 0.0001	No
Gannet	8.1	0.04 to 0.06	26,784	2170	21.7	5.4	0.001 to 0.002	0.0001 to 0.0002	No
St Kilda SPA									
Gannet	8.1	0.03 to 0.05	120,580	9767	97.7	24.1	0.0003 to 0.0005	0.00002 to 0.00004	No

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an annual apportioned consequent mortality of ≥1 and/ or an increase in baseline mortality of ≥1%. Cells highlighted red indicate the sites and features taken through for PVA.

Table 29. Project alone predicted impacts from collision when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA									
Herring gull	16	0.05	4,154	665	6.6	0.8	0.01	0.001	No
Kittiwake	14.6	0.7	22,590	3298	33.0	4.5	0.02	0.003	No
Troup, Pennan and Lion's Head SPA									
Kittiwake	14.6	0.6	21,232	3100	31.0	4.2	0.02	0.003	No
Gannet	8.1	**1.2**	9,650	782	7.8	1.9	0.15	0.012	No
Herring gull	16	0.03	1,092	175	1.7	0.2	0.02	0.003	No
Fowlsheugh SPA									
Kittiwake	14.6	0.4	28,078	4099	41.0	5.6	0.01	0.001	No
East Caithness Cliffs SPA									
Kittiwake	14.6	0.7	48,920	7142	71.4	9.8	0.01	0.001	No
North Caithness Cliffs SPA									
Kittiwake	14.6	0.1	11,136	1626	16.3	2.2	0.01	0.001	No
Forth Islands SPA									
Kittiwake	14.6	0.1	7,162	1046	10.5	1.4	0.01	0.001	No
Gannet	8.1	**5.5**	150,518	12192	121.9	30.1	0.05	0.004	No
Copinsay SPA									
Kittiwake	14.6	0.02	1,910	279	2.8	0.4	0.01	0.001	No
Hoy SPA									
Kittiwake	14.6	0.006	608	89	0.9	0.1	0.01	0.001	No

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
St Abb's Head to Fast Castle SPA									
Kittiwake	14.6	0.1	9,200	1343	13.4	1.8	0.01	0.001	No
Fair Isle SPA									
Kittiwake	14.6	0.008	646	94	0.9	0.1	0.01	0.001	No
Gannet	8.1	0.3	9,942	805	8.1	2.0	0.04	0.003	No
Calf of Eday SPA									
Kittiwake	14.6	0.006	284	41	0.4	0.1	0.01	0.002	No
Rousay SPA									
Kittiwake	14.6	0.01	660	96	1.0	0.1	0.01	0.002	No
Marwick Head SPA									
Kittiwake	14.6	0.01	1,812	265	2.6	0.4	0.004	0.001	No
West Westray SPA									
Kittiwake	14.6	0.1	5,510	804	8.0	1.1	0.01	0.002	No
Farne Islands SPA									
Kittiwake	14.6	0.1	8,804	1285	12.9	1.8	0.01	0.001	No
Cape Wrath SPA									
Kittiwake	14.6	0.03	7,216	1054	10.5	1.4	0.003	0.0004	No
Sumburgh Head SPA									
Kittiwake	14.6	0.005	864	126	1.3	0.2	0.004	0.001	No
Handa SPA									
Kittiwake	14.6	0.02	5,150	752	7.5	1.0	0.002	0.0003	No
Sule Skerry and Sule Stack SPA									

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Gannet	8.1	0.3	18,130	1469	14.7	3.6	0.02	0.002	No
Coquet Island SPA									
Kittiwake	14.6	0.008	932	136	1.4	0.2	0.01	0.001	No
Noss SPA									
Kittiwake	14.6	0.004	154	22	0.2	0.0	0.02	0.003	No
Gannet	8.1	0.6	27,530	2230	22.3	5.5	0.03	0.002	No
Foula SPA									
Kittiwake	14.6	0.004	850	124	1.2	0.2	0.003	0.0005	No
North Rona and Sula Sgeir SPA									
Gannet	8.1	0.2	22,460	1819	18.2	4.5	0.01	0.001	No
Hermaness, Saxa Vord and Valla Field SPA									
Gannet	8.1	0.8	51,160	4144	41.4	10.2	0.02	0.002	No
Flamborough and Filey Coast SPA									
Kittiwake	14.6	0.2	91,008	13287	132.9	18.2	0.00	0.0002	No
Gannet	8.1	0.5	26,784	2170	21.7	5.4	0.02	0.002	No
St Kilda SPA									
Gannet	8.1	0.6	120,580	9767	97.7	24.1	0.01	0.0005	No

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an annual apportioned consequent mortality of ≥1 and/ or an increase in baseline mortality of ≥1%. Cells highlighted red indicate the sites and features taken through for PVA.

Table 30. Project alone predicted impacts from collision and displacement combined when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA									
Kittiwake	14.6	0.8 - **1.0**	22,590	3298	33.0	4.5	0.02 - 0.03	0.004 - 0.004	No
Troup, Pennan and Lion's Head SPA									
Kittiwake	14.6	0.7 - 0.8	21,232	3100	31.0	4.2	0.02 - 0.03	0.003 - 0.004	No
Gannet	8.1	**1.25 - 1.30**	9,650	782	7.8	1.9	0.16 - 0.17	0.013 - 0.014	No
Fowlsheugh SPA									
Kittiwake	14.6	0.5 - 0.6	28,078	4099	41.0	5.6	0.01 - 0.01	0.002 - 0.002	No
East Caithness Cliffs SPA									
Kittiwake	14.6	0.8 - **1.0**	48,920	7142	71.4	9.8	0.01 - 0.01	0.002 - 0.002	No
North Caithness Cliffs SPA									
Kittiwake	14.6	0.1 - 0.1	11,136	1626	16.3	2.2	0.01 - 0.01	0.001 - 0.001	No
Forth Islands SPA									
Kittiwake	14.6	0.1 - 0.1	7,162	1046	10.5	1.4	0.01 - 0.01	0.002 - 0.002	No
Gannet	8.1	**5.8 - 6.0**	150,518	12192	121.9	30.1	0.05 - 0.05	0.004 - 0.004	No
Copinsay SPA									
Kittiwake	14.6	0.01 - 0.02	1,910	279	2.8	0.4	0.007 - 0.011	0.001 - 0.002	No
Hoy SPA									
Kittiwake	14.6	0.007 - 0.008	608	89	0.9	0.1	0.008 - 0.009	0.0012 - 0.0013	No
St Abb's Head to Fast Castle SPA									
Kittiwake	14.6	0.11 - 0.13	9,200	1343	13.4	1.8	0.01 - 0.01	0.001 - 0.001	No

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Fair Isle SPA									
Kittiwake	14.6	0.009 - 0.012	646	94	0.9	0.1	0.010 - 0.014	0.001 - 0.002	No
Gannet	8.1	0.32 - 0.33	9,942	805	8.1	2.0	0.04 - 0.04	0.003 - 0.003	No
Calf of Eday SPA									
Kittiwake	14.6	0.007 - 0.009	284	41	0.4	0.1	0.017 - 0.022	0.002 - 0.003	No
Rousay SPA									
Kittiwake	14.6	0.016 - 0.021	660	96	1.0	0.1	0.017 - 0.022	0.002 - 0.003	No
Marwick Head SPA									
Kittiwake	14.6	0.012 - 0.015	1,812	265	2.6	0.4	0.005 - 0.006	0.0007 - 0.0008	No
West Westray SPA									
Kittiwake	14.6	0.12 - 0.15	5,510	804	8.0	1.1	0.01 - 0.02	0.002 - 0.003	No
Farne Islands SPA									
Kittiwake	14.6	0.11 - 0.13	8,804	1285	12.9	1.8	0.01 - 0.01	0.001 - 0.001	No
Cape Wrath SPA									
Kittiwake	14.6	0.03 - 0.035	7,216	1054	10.5	1.4	0.0028 - 0.0033	0.0004 - 0.0005	No
Sumburgh Head SPA									
Kittiwake	14.6	0.006 - 0.007	864	126	1.3	0.2	0.005 - 0.006	0.0007 - 0.0008	No
Handa SPA									
Kittiwake	14.6	0.018 - 0.022	5,150	752	7.5	1.0	0.002 - 0.003	0.0003 - 0.0004	No
Sule Skerry and Sule Stack SPA									
Gannet	8.1	0.31 - 0.31	18,130	1469	14.7	3.6	0.02 - 0.02	0.002 - 0.002	No
Coquet Island SPA									

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Kittiwake	14.6	0.009 - 0.011	932	136	1.4	0.2	0.007 - 0.008	0.0010 - 0.0012	No
Noss SPA									
Kittiwake	14.6	0.005 - 0.006	154	22	0.2	0.0	0.02 - 0.03	0.003 - 0.004	No
Gannet	8.1	0.64 - 0.65	27,530	2230	22.3	5.5	0.03 - 0.03	0.002 - 0.002	No
Foula SPA									
Kittiwake	14.6	0.005 - 0.006	850	124	1.2	0.2	0.02 - 0.03	0.003 - 0.004	No
North Rona and Sula Sgeir SPA									
Gannet	8.1	0.21 - 0.21	22,460	1819	18.2	4.5	0.01 - 0.01	0.001 - 0.001	No
Hermaness, Saxa Vord and Valla Field SPA									
Gannet	8.1	0.87 - 0.90	51,160	4144	41.4	10.2	0.02 - 0.02	0.002 - 0.002	No
Flamborough and Filey Coast SPA									
Kittiwake	14.6	0.24 - 0.33	91,008	13287	132.9	18.2	0.002 - 0.002	0.0003 - 0.0004	No
Gannet	8.1	0.54 - 0.56	26,784	2170	21.7	5.4	0.02 - 0.03	0.002 - 0.002	No
St Kilda SPA									
Gannet	8.1	0.63 - 0.65	120,580	9767	97.7	24.1	0.01 - 0.01	0.001 - 0.001	No

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an annual apportioned consequent mortality of ≥1 and/ or an increase in baseline mortality of ≥1%. Cells highlighted red indicate the sites and features taken through for PVA.

5.2.2 Project alone impacts using SNCB's Approach

Table 31. Project alone predicted impacts from displacement response when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA									
Guillemot	6.1	**15.9 - 28.2**	45,067	2749	27.5	9.0	0.6 - **1.0**	**0.04 - 0.06**	**Yes**
Kittiwake	14.6	0.1 - 0.3	22,590	3298	33.0	4.5	0.003 - 0.009	0.0004 - 0.0013	No
Troup, Pennan and Lion's Head SPA									
Guillemot	6.1	**6.3 - 11.8**	31,893	1945	19.5	6.4	0.3 - 0.6	**0.02 - 0.04**	**Yes**
Razorbill	10.5	0.7 - **1.2**	6,054	636	6.4	1.2	0.1 - 0.2	0.01 - **0.02**	**Yes**
Kittiwake	14.6	0.08 - 0.24	21,232	3100	31.0	4.2	0.003 - 0.008	0.0004 - 0.0011	No
Gannet	8.1	0.10 - 0.24	9,650	782	7.8	1.9	0.01 - 0.03	0.001 - 0.002	No
Fowlsheugh SPA									
Guillemot	6.1	**2.9 - 8.6**	93,570	5708	57.1	18.7	0.1 - 0.2	0.003 - 0.009	No
Razorbill	10.5	0.001 - 0.004	18,844	1979	19.8	3.8	0.0001 - 0.0002	0.00001 - 0.00002	No
Kittiwake	14.6	0.06 - 0.18	28,078	4099	41.0	5.6	0.001 - 0.004	0.0002 - 0.0006	No
East Caithness Cliffs SPA									
Guillemot	6.1	**29.0 - 60.0**	199,992	12200	122.0	40.0	0.2 - 0.5	0.012 - **0.03**	**Yes**
Razorbill	10.5	2.5 - 4.2	40,256	4227	42.3	8.1	0.06 - 0.10	0.006 - 0.011	No
Kittiwake	14.6	0.10 - 0.31	48,920	7142	71.4	9.8	0.001 - 0.004	0.0002 - 0.0006	No
North Caithness Cliffs SPA									
Guillemot	6.1	**6.7 - 16.4**	52,076	3177	31.8	10.4	0.2 - 0.5	0.01 - **0.03**	**Yes**

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Razorbill	10.5	0.1 - 0.2	4,694	493	4.9	0.9	0.03 - 0.05	0.003 - 0.005	No
Puffin	9.4	0.05 - 0.09	3,053	287	2.9	0.6	0.02 - 0.03	0.002 - 0.003	No
Kittiwake	14.6	0.01 - 0.03	11,136	1626	16.3	2.2	0.001 - 0.002	0.0001 - 0.0003	No
Forth Islands SPA									
Puffin	9.4	0.4 - 0.8	10,229	962	9.6	2.0	0.04 - 0.08	0.004 - 0.008	No
Kittiwake	14.6	0.01 - 0.03	7,162	1046	10.5	1.4	0.001 - 0.003	0.0001 - 0.0004	No
Gannet	8.1	**0.5 - 1.4**	150,518	12192	121.9	30.1	0.004 - 0.011	0.0003 - 0.0009	No
Copinsay SPA									
Guillemot	6.1	**1.8 - 3.6**	24,728	1508	15.1	4.9	0.1 - 0.2	0.007 - 0.015	No
Kittiwake	14.6	0.00 - 0.01	1,910	279	2.8	0.4	0.000 - 0.004	0.000 - 0.001	No
Hoy SPA									
Puffin	9.4	0.01 - 0.03	361	34	0.3	0.1	0.03 - 0.09	0.003 - 0.008	No
Kittiwake	14.6	0.001 - 0.002	608	89	0.9	0.1	0.001 - 0.002	0.0002 - 0.0003	No
St Abb's Head to Fast Castle SPA									
Kittiwake	14.6	0.01 - 0.03	9,200	1343	13.4	1.8	0.001 - 0.002	0.0001 - 0.0004	No
Fair Isle SPA									
Puffin	9.4	0.1 - 0.2	6,666	627	6.3	1.3	0.02 - 0.03	0.002 - 0.003	No
Kittiwake	14.6	0.001 - 0.004	646	94	0.9	0.1	0.001 - 0.004	0.0002 - 0.0006	No
Gannet	8.1	0.03 - 0.08	9,942	805	8.1	2.0	0.004 - 0.010	0.0003 - 0.0008	No
Calf of Eday SPA									
Kittiwake	14.6	0.001 - 0.003	284	41	0.4	0.1	0.002 - 0.007	0.0004 - 0.0011	No
Rousay SPA									

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Kittiwake	14.6	0.002 - 0.007	660	96	1.0	0.1	0.002 - 0.007	0.0003 - 0.0011	No
Marwick Head SPA									
Kittiwake	14.6	0.001 - 0.004	1,812	265	2.6	0.4	0.0004 - 0.0015	0.0001 - 0.0002	No
West Westray SPA									
Kittiwake	14.6	0.02 - 0.05	5,510	804	8.0	1.1	0.002 - 0.006	0.0003 - 0.0009	No
Farne Islands SPA									
Guillemot	6.1	**3.6 - 10.8**	85,816	5235	52.3	17.2	0.07 - 0.21	0.004 - 0.013	No
Puffin	9.4	0.04 - 0.13	87,504	8225	82.3	17.5	0.0005 - 0.0016	0.00005 - 0.00015	No
Kittiwake	14.6	0.009 - 0.028	8,804	1285	12.9	1.8	0.001 - 0.002	0.0001 - 0.0003	No
Cape Wrath SPA									
Puffin	9.4	0.02 - 0.03	2,244	211	2.1	0.4	0.01 - 0.01	0.001 - 0.001	No
Kittiwake	14.6	0.003 - 0.008	7,216	1054	10.5	1.4	0.0003 - 0.0008	0.00004 - 0.00011	No
Sumburgh Head SPA									
Kittiwake	14.6	0.001 - 0.002	864	126	1.3	0.2	0.001 - 0.002	0.0001 - 0.0002	No
Handa SPA									
Kittiwake	14.6	0.002 - 0.005	5,150	752	7.5	1.0	0.0003 - 0.0007	0.00004 - 0.00010	No
Sule Skerry and Sule Stack SPA									
Puffin	9.4	0.9 - **1.4**	95,484	8975	89.8	19.1	0.01 - 0.02	0.001 - 0.001	No
Gannet	8.1	0.02 - 0.05	18,130	1469	14.7	3.6	0.001 - 0.003	0.0001 - 0.0003	No
Coquet Island SPA									
Puffin	9.4	0.01 - 0.04	50,058	4705	47.1	10.0	0.0002 - 0.0009	0.00002 - 0.00008	No
Kittiwake	14.6	0.001 - 0.003	932	136	1.4	0.2	0.001 - 0.002	0.0001 - 0.0003	No

Species	Adult Mortality Rate (%)	Annual apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Noss SPA									
Puffin	9.4	0.01 - 0.02	1,174	110	1.1	0.2	0.01 - 0.02	0.001 - 0.002	No
Kittiwake	14.6	0.001 - 0.002	154	22	0.2	0.0	0.004 - 0.009	0.001 - 0.001	No
Gannet	8.1	0.05 - 0.16	27,530	2230	22.3	5.5	0.002 - 0.007	0.0002 - 0.0006	No
Foula SPA									
Puffin	9.4	0.05 - 0.10	6,351	597	6.0	1.3	0.01 - 0.02	0.001 - 0.002	No
Kittiwake	14.6	0.001 - 0.002	850	124	1.2	0.2	0.001 - 0.002	0.0001 - 0.0002	No
North Rona and Sula Sgeir SPA									
Gannet	8.1	0.01 - 0.04	22,460	1819	18.2	4.5	0.001 - 0.002	0.00004 - 0.00018	No
Hermaness, Saxa Vord and Valla Field SPA									
Gannet	8.1	0.1 - 0.3	51,160	4144	41.4	10.2	0.002 - 0.007	0.0002 - 0.0006	No
Flamborough and Filey Coast SPA									
Guillemot	6.1	**4.3 - 12.8**	121,754	7427	74.3	24.4	0.06 - 0.17	0.004 - 0.011	No
Razorbill	10.5	0.004 - 0.011	40,506	4253	42.5	8.1	0.0001 - 0.0003	0.00001 - 0.00003	No
Kittiwake	14.6	0.04 - 0.13	91,008	13287	132.9	18.2	0.0003 - 0.0009	0.00005 - 0.00014	No
Gannet	8.1	0.05 - 0.16	26,784	2170	21.7	5.4	0.002 - 0.007	0.0002 - 0.0006	No
St Kilda SPA									
Gannet	8.1	0.05 - 0.15	120,580	9767	97.7	24.1	0.001 - 0.002	0.00004 - 0.00012	No

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an annual apportioned consequent mortality of ≥1 and/ or an increase in baseline mortality of ≥1%. Cells highlighted red indicate the sites and features taken through for PVA.

Table 32. Project alone predicted impacts from collision when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA									
Herring gull	16	0.06 - 0.08	4,154	665	6.6	0.8	0.01 - 0.01	0.001 - 0.002	No
Kittiwake	14.6	**1.0 - 1.1**	22,590	3298	33.0	4.5	0.03 - 0.03	0.004 - 0.005	No
Troup, Pennan and Lion's Head SPA									
Kittiwake	14.6	0.8 - 0.9	21,232	3100	31.0	4.2	0.03 - 0.03	0.004 - 0.004	No
Gannet	8.1	**1.3**	9,650	782	7.8	1.9	0.20	0.013	No
Herring gull	16	0.03 - 0.04	1,092	175	1.7	0.2	0.02 - 0.02	0.003 - 0.004	No
Fowlsheugh SPA									
Kittiwake	14.6	0.6 - 0.7	28,078	4099	41.0	5.6	0.01 - 0.02	0.002 - 0.002	No
East Caithness Cliffs SPA									
Kittiwake	14.6	**1.1 - 1.3**	48,920	7142	71.4	9.8	0.02 - 0.02	0.002 - 0.003	No
North Caithness Cliffs SPA									
Kittiwake	14.6	0.2 - 0.3	11,136	1626	16.3	2.2	0.01 - 0.02	0.002 - 0.003	No
Forth Islands SPA									
Kittiwake	14.6	0.13 - 0.15	7,162	1046	10.5	1.4	0.012 - 0.014	0.0018 - 0.0021	No
Gannet	8.1	**6.2**	150,518	12192	121.9	30.1	0.05	0.004	No
Copinsay SPA									
Kittiwake	14.6	0.030 - 0.035	1,910	279	2.8	0.4	0.011 - 0.013	0.0016 - 0.0018	No

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Hoy SPA									
Kittiwake	14.6	0.009 - 0.011	608	89	0.9	0.1	0.010 - 0.012	0.001 - 0.002	No
St Abb's Head to Fast Castle SPA									
Kittiwake	14.6	0.1 - 0.2	9,200	1343	13.4	1.8	0.01 - 0.01	0.001 - 0.002	No
Fair Isle SPA									
Kittiwake	14.6	0.01 - 0.02	646	94	0.9	0.1	0.01 - 0.02	0.002 - 0.003	No
Gannet	8.1	0.3	9,942	805	8.1	2.0	0.04	0.003	No
Calf of Eday SPA									
Kittiwake	14.6	0.010 - 0.012	284	41	0.4	0.1	0.02 - 0.03	0.003 - 0.004	No
Rousay SPA									
Kittiwake	14.6	0.02 - 0.03	660	96	1.0	0.1	0.02 - 0.03	0.003 - 0.005	No
Marwick Head SPA									
Kittiwake	14.6	0.01 - 0.02	1,812	265	2.6	0.4	0.006 - 0.008	0.0009 - 0.0011	No
West Westray SPA									
Kittiwake	14.6	0.2 - 0.2	5,510	804	8.0	1.1	0.02 - 0.02	0.004 - 0.004	No
Farne Islands SPA									
Kittiwake	14.6	0.1 - 0.1	8,804	1285	12.9	1.8	0.01 - 0.01	0.001 - 0.001	No
Cape Wrath SPA									
Kittiwake	14.6	0.03 - 0.04	7,216	1054	10.5	1.4	0.003 - 0.004	0.0005 - 0.0006	No
Sumburgh Head SPA									
Kittiwake	14.6	0.007 - 0.008	864	126	1.3	0.2	0.005 - 0.006	0.0008 - 0.0009	No
Handa SPA									

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Kittiwake	14.6	0.02 - 0.03	5,150	752	7.5	1.0	0.003 - 0.004	0.0004 - 0.0006	No
Sule Skerry and Sule Stack SPA									
Gannet	8.1	0.3	18,130	1469	14.7	3.6	0.02	0.002	No
Coquet Island SPA									
Kittiwake	14.6	0.011 - 0.014	932	136	1.4	0.2	0.008 - 0.010	0.001 - 0.002	No
Noss SPA									
Kittiwake	14.6	0.006 - 0.007	154	22	0.2	0.0	0.027 - 0.031	0.004 - 0.005	No
Gannet	8.1	0.6	27,530	2230	22.3	5.5	0.03	0.002	No
Foula SPA									
Kittiwake	14.6	0.007 - 0.008	850	124	1.2	0.2	0.005 - 0.006	0.0008 - 0.0009	No
North Rona and Sula Sgeir SPA									
Gannet	8.1	0.2	22,460	1819	18.2	4.5	0.01	0.001	No
Hermaness, Saxa Vord and Valla Field SPA									
Gannet	8.1	0.9	51,160	4144	41.4	10.2	0.02	0.002	No
Flamborough and Filey Coast SPA									
Kittiwake	14.6	0.4 - 0.5	91,008	13287	132.9	18.2	0.0 - 0.0	0.0004 - 0.0005	No
Gannet	8.1	0.5	26,784	2170	21.7	5.4	0.02	0.002	No
St Kilda SPA									
Gannet	8.1	0.7	120,580	9767	97.7	24.1	0.01	0.001	No

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an annual apportioned consequent mortality of ≥1 and/ or an increase in baseline mortality of ≥1%. Cells highlighted red indicate the sites and features taken through for PVA.

Table 33. Project alone predicted combined impacts from collision and displacement when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold (birds)	0.02 percentage point change in survival threshold (birds)	Increase in baseline mortality (%)	percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA									
Kittiwake	14.6	**1.1 - 1.4**	22,590	3298	33.0	4.5	0.03 - 0.04	0.005 - 0.006	No
Troup, Pennan and Lion's Head SPA									
Kittiwake	14.6	0.9 - **1.1**	21,232	3100	31.0	4.2	0.03 - 0.04	0.004 - 0.005	No
Gannet	8.1	**1.4 - 1.5**	9,650	782	7.8	1.9	0.2 - 0.2	0.015 - 0.016	No
Fowlsheugh SPA									
Kittiwake	14.6	0.7 - 0.9	28,078	4099	41.0	5.6	0.02 - 0.02	0.002 - 0.003	No
East Caithness Cliffs SPA									
Kittiwake	14.6	**1.2 - 1.6**	48,920	7142	71.4	9.8	0.02 - 0.02	0.002 - 0.003	No
North Caithness Cliffs SPA									
Kittiwake	14.6	0.2 - 0.3	11,136	1626	16.3	2.2	0.01 - 0.02	0.002 - 0.003	No
Forth Islands SPA									
Kittiwake	14.6	0.14 - 0.18	7,162	1046	10.5	1.4	0.01 - 0.02	0.002 - 0.003	No
Gannet	8.1	**6.7 - 7.6**	150,518	12192	121.9	30.1	0.05 - 0.06	0.004 - 0.005	No
Copinsay SPA									
Kittiwake	14.6	0.03 - 0.05	1,910	279	2.8	0.4	0.011 - 0.016	0.0016 - 0.0024	No
Hoy SPA									
Kittiwake	14.6	0.010 - 0.013	608	89	0.9	0.1	0.011 - 0.015	0.0016 - 0.0021	No
St Abb's Head to Fast Castle SPA									

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold (birds)	0.02 percentage point change in survival threshold (birds)	Increase in baseline mortality (%)	percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Kittiwake	14.6	0.1 - 0.2	9,200	1343	13.4	1.8	0.01 - 0.02	0.001 - 0.003	No
Fair Isle SPA									
Kittiwake	14.6	0.011 - 0.024	646	94	0.9	0.1	0.01 - 0.03	0.002 - 0.004	No
Gannet	8.1	0.3 - 0.4	9,942	805	8.1	2.0	0.04 - 0.05	0.003 - 0.004	No
Calf of Eday SPA									
Kittiwake	14.6	0.011 - 0.015	284	41	0.4	0.1	0.03 - 0.04	0.004 - 0.005	No
Rousay SPA									
Kittiwake	14.6	0.022 - 0.037	660	96	1.0	0.1	0.02 - 0.04	0.003 - 0.006	No
Marwick Head SPA									
Kittiwake	14.6	0.018 - 0.024	1,812	265	2.6	0.4	0.007 - 0.009	0.0010 - 0.0013	No
West Westray SPA									
Kittiwake	14.6	0.2 - 0.3	5,510	804	8.0	1.1	0.03 - 0.03	0.004 - 0.005	No
Farne Islands SPA									
Kittiwake	14.6	0.11 - 0.13	8,804	1285	12.9	1.8	0.01 - 0.01	0.001 - 0.001	No
Cape Wrath SPA									
Kittiwake	14.6	0.04 - 0.05	7,216	1054	10.5	1.4	0.004 - 0.005	0.0006 - 0.0007	No
Sumburgh Head SPA									
Kittiwake	14.6	0.008 - 0.010	864	126	1.3	0.2	0.006 - 0.008	0.0009 - 0.0012	No
Handa SPA									
Kittiwake	14.6	0.022 - 0.035	5,150	752	7.5	1.0	0.003 - 0.005	0.0004 - 0.0007	No
Sule Skerry and Sule Stack SPA									

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold (birds)	0.02 percentage point change in survival threshold (birds)	Increase in baseline mortality (%)	percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Gannet	8.1	0.3 - 0.4	18,130	1469	14.7	3.6	0.02 - 0.02	0.002 - 0.002	No
Coquet Island SPA									
Kittiwake	14.6	0.012 - 0.017	932	136	1.4	0.2	0.009 - 0.012	0.001 - 0.002	No
Noss SPA									
Kittiwake	14.6	0.007 - 0.009	154	22	0.2	0.0	0.03 - 0.04	0.005 - 0.006	No
Gannet	8.1	0.7 - 0.8	27,530	2230	22.3	5.5	0.029 - 0.034	0.002 - 0.003	No
Foula SPA									
Kittiwake	14.6	0.008 - 0.010	850	124	1.2	0.2	0.006 - 0.008	0.0009 - 0.0012	No
North Rona and Sula Sgeir SPA									
Gannet	8.1	0.21 - 0.24	22,460	1819	18.2	4.5	0.01 - 0.01	0.001 - 0.001	No
Hermaness, Saxa Vord and Valla Field SPA									
Gannet	8.1	**1.0 - 1.2**	51,160	4144	41.4	10.2	0.02 - 0.03	0.002 - 0.002	No
Flamborough and Filey Coast SPA									
Kittiwake	14.6	0.4 - 0.6	91,008	13287	132.9	18.2	0.003 - 0.005	0.0005 - 0.0007	No
Gannet	8.1	0.6 - 0.7	26,784	2170	21.7	5.4	0.03 - 0.03	0.002 - 0.002	No
St Kilda SPA									
Gannet	8.1	0.8 - 0.9	120,580	9767	97.7	24.1	0.01 - 0.01	0.001 - 0.001	No

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an annual apportioned consequent mortality of ≥1 and/ or an increase in baseline mortality of ≥1%. Cells highlighted red indicate the sites and features taken through for PVA.

5.3 Summary Project Alone Impacts

Assessments undertaken using the Applicant's Approach, when considering impacts from displacement, collision and from displacement and collision combined indicated impacts to all features and designated sites to be below the threshold for undertaking further assessment using PVA. This was regardless of the metric used (Applicant's 1% increase in baseline mortality or SNCB's 0.02 percentage point change in survival) as a trigger for undertaking PVA. Therefore, the potential for an AEoSI to the conservation objectives of all features and sites considered for the Project alone can be ruled under the Applicant's Approach.

Assessments undertaken using the SNCB's Approach, when considering impacts from displacement, indicated impacts to five features from four different designated sites to have reached the threshold for undertaking further assessment using PVA as shown in **Table 34**.

Table 34. Impacts from displacement to sites and features which have reached a threshold for undertaking PVA for the Project alone impacts.

Species	Annual apportioned consequent mortality	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)
Buchan Ness to Collieston Coast SPA				
Guillemot	**15.9 - 28.2**	0.6 - **1.0**	**0.04 - 0.06**	**Yes**
Troup, Pennan and Lion's Head SPA				
Guillemot	**6.3 - 11.8**	0.3 - 0.6	**0.02 - 0.04**	**Yes**
Razorbill	0.7 - **1.2**	0.1 - 0.2	0.01 - **0.02**	**Yes**
East Caithness Cliffs SPA				
Guillemot	**29.0 - 60.0**	0.2 - 0.5	0.012 - **0.03**	**Yes**
North Caithness Cliffs SPA				
Guillemot	**6.7 - 16.4**	0.2 - 0.5	0.01 - **0.03**	**Yes**

Yellow highlighted cells and values in bold indicate: threshold for metric reached. Cells highlighted red indicate the sites and features taken through for PVA.

Assessments undertaken using the SNCB's Approach, when considering impacts from collision and from displacement and collision combined, indicated impacts to all features from any designated sites to be below the threshold for undertaking further assessment using PVA. This was regardless of the metric used (Applicant's 1% increase in baseline mortality or SNCB's 0.02 percentage point change in survival) as a trigger for undertaking PVA. Therefore, the potential for an AEoSI to the conservation objectives of all features and from all designated sites considered from the Project alone can be ruled out for impacts from collision and from displacement and collision combined.

The assessment using both the Applicant's Approach and SNCB's Approach demonstrated that the impacts from the Project alone are minimal, with the majority of annual mortality rates to individual features from designated sites being less than a single bird. The Applicant's view is that **where impacts to features from designated sites from the Project alone are less than one mortality per annum and the effect is a change of less than 0.02 percentage points in survival, any impact will be negligible and that an AEoSI as a result of this level of impact can be ruled out.**

Effects of this magnitude represents a proportion of a population that is so small that it is considered to be practically unmeasurable with any accuracy and, therefore, the Applicant considers there will be no tangible contribution to the in-combination impact. It is, therefore, judged that an impact of this magnitude is negligible by definition and can be discounted from requiring further assessment; consequently in these instances, no in-combination assessment is provided other than where specified in the in-combination assessment in **Section 5.4**.

5.4 Potential In-Combination Impacts

Potential impacts that have been assessed for the Project in-combination with other plans and projects have been assessed for displacement response, collision risk and the two combined impacts, using the Applicant's Approach (**In-combination impacts** using Applicant's approach
Table 35, **Table 36**, **Table 37**,
Table 38, **Table 39** and **Table 40**) and SNCB's Approach (**In-combination impacts** using SNCB's approach
Table 41, **Table 42**,
Table 43, **Table 44**,
Table 45 and **Table 46**). Potential impacts from the Project in-combination with other plans and projects have been assessed for features of designated sites when the contribution from the Project alone is an annual mortality of one bird or more and / or where NatureScot have concluded an AEoSI for Berwick Bank (either alone or in combination) and the Project has any contribution, as requested during consultation (see **Table 1**, item 8).

Potential impacts from the Project in-combination with other plans and projects for features of English designated sites (Farne Islands SPA, Coquet Island SPA and Flamborough and Filey Coast SPA) have not been considered further in this Report (Project alone impacts presented in **Section 5.2**). This is in agreement with Natural England's conclusion of no AEoSI for any English features of designated sites from the Project and, therefore, no further assessments are required (see **Table 1**, item 37).

Potential impacts for the Project in-combination with other plans and projects have been assessed with and without the contribution from Berwick Bank, as that project is major contributor to all impacts to features from Scottish designated sites and its consent has not yet been determined.

The annual impacts assessed for the Project in-combination with other plans and projects apportioned for each feature from different designated sites were derived as follows:

- In-combination displacement mortalities for other projects were taken from the recently submitted Berwick Bank application (especially the Berwick Bank OWF RIAA, (SSE, 2022)). For features of designated sites that were not assessed in the Berwick Bank RIAA, displacement mortalities are as provided in the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment**. In-combination displacement impacts are presented with and without the inclusion of impacts to features from designated sites from Berwick Bank OWF. A worked example of in-combination displacement impacts for guillemot from Buchan Ness to Collieston Coast SPA using the Applicant's Approach including Berwick Bank is as follows:

8.8[1] + 5.1[2] = 13.9

[1] Value from Berwick Bank RIAA table 5.143 (Annual developer) [2] Value from Green Volt Offshore Windfarm Report to Inform Appropriate Assessment Section7.2.2

- In-combination collision mortalities for other projects have been taken from the recently submitted Berwick Bank application (Berwick Bank OWF RIAA (SSE, 2022)). The Green Volt Project's updated apportioned collision mortalities are included as presented for kittiwake in **Table 23** and **Table 24** and gannet in **Table 25** and **Table 26**. For features of designated sites that were not assessed in the Berwick Bank RIAA, collision mortalities are as provided in the **Green Volt Offshore Windfarm Report to Inform Appropriate Assessment**. In-combination collision impacts are presented with and without the inclusion of impacts to features from designated sites from Berwick Bank OWF.

5.4.1 In-combination impacts using Applicant's approach

Table 35. Predicted impacts from displacement in-combination with other projects when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution to mortalities
Buchan Ness to Collieston Coast SPA										
Guillemot	6.1	13.9	45,067	2749	27.5	9.0	0.51	**0.031**	**Yes**	**5.1**
Kittiwake*	14.6	9.0 - 26.9	22,590	3298	33.0	4.5	0.27 - 0.82	**0.040 - 0.119**	**Yes**	0.1 to 0.3
Troup, Pennan and Lion's Head SPA										
Guillemot	6.1	12.8	31,893	1945	19.5	6.4	0.66	**0.040**	**Yes**	**2.3**
Razorbill*	10.5	4.2	6,054	636	6.4	1.2	0.66 - 0.66	**0.069 - 0.069**	**Yes**	0.2
Kittiwake*	14.6	13.6 - 40.8	21,232	3100	31.0	4.2	0.44 - **1.32**	**0.064 - 0.192**	**Yes**	0.08 to 0.24
Fowlsheugh SPA										
Guillemot*	6.1	156.5	93,570	5708	57.1	18.7	**2.70**	**0.167**	**Yes**	**2.4**
Razorbill*	10.5	20.7	18,844	1979	19.8	3.8	**1.05**	**0.110**	**Yes**	0.0
Kittiwake*	14.6	26.2 - 78.4	28,078	4099	41.0	5.6	0.64 - **1.91**	**0.093 - 0.28**	**Yes**	0.06 to 0.18
East Caithness Cliffs SPA										
Guillemot	6.1	202.2	199,992	12200	122.0	40.0	**1.66**	**0.101**	**Yes**	**13.0**
Razorbill*	10.5	48.5	40,256	4227	42.3	8.1	**1.15**	**0.121**	**Yes**	0.7
Kittiwake*	14.6	59.1 - 177.3	48,920	7142	71.4	9.8	0.83 - **2.48**	**0.121 - 0.362**	**Yes**	0.1 to 0.3
North Caithness Cliffs SPA										
Guillemot	6.1	30.5	52,076	3177	31.8	10.4	0.96	**0.059**	**Yes**	**4.0**
Kittiwake*	14.6	7.6 - 22.9	11,136	1626	16.3	2.2	0.47 - **1.41**	**0.068 - 0.206**	**Yes**	0.01 to 0.03

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution to mortalities
Forth Islands SPA										
Puffin*	9.4	44.5	10,229	962	9.6	2.0	**4.60**	**0.453**	**Yes**	0.2
Kittiwake*	14.6	10.9 - 32.7	7,162	1046	10.5	1.4	**1.04 - 3.13**	**0.152 - 0.457**	**Yes**	0.01 to 0.03
Gannet*	8.1	94.3 - 135.6	150,518	12192	121.9	30.1	0.77 - **1.11**	**0.063 - 0.090**	**Yes**	0.3 to 0.5
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	34.5 - 103.0	9,200	1343	13.4	1.8	**2.57 - 7.67**	**0.375 - 0.120**	**Yes**	0.01 to 0.03
West Westray SPA										
Kittiwake*	14.6	7.9 - 23.7	5,510	804	8.0	1.1	0.98 - **2.94**	**0.144 - 0.429**	**Yes**	0.02 to 0.05
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	12.3 - 16.6	51,160	4144	41.4	10.2	0.3 - 0.4	**0.024 - 0.032**	**Yes**	0.07 to 0.1

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 36. Predicted impacts from displacement in-combination with other projects (not including Berwick Bank) when considering the 'Applicant's Approach'.

Site	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution to mortalities
Buchan Ness to Collieston Coast SPA										
Guillemot	6.1	9	45,067	2749	27.5	9.0	0.33	**0.02**	**Yes**	**5.1**
Kittiwake*	14.6	6.7 - 20.1	22,590	3298	33.0	4.5	0.2 - 0.6	**0.03 - 0.09**	**Yes**	0.1 to 0.3
Troup, Pennan and Lion's Head SPA										
Guillemot	6.1	10.4	31,893	1945	19.5	6.4	0.53	**0.03**	**Yes**	**2.3**
Razorbill*	10.5	3.5	6,054	636	6.4	1.2	0.55	**0.06**	**Yes**	0.2
Kittiwake*	14.6	11.4 - 34.3	21,232	3100	31.0	4.2	0.37 - **1.11**	**0.05 - 0.16**	**Yes**	0.08 to 0.24
Fowlsheugh SPA										
Guillemot	6.1	67.5	93,570	5708	57.1	18.7	**1.18**	**0.07**	**Yes**	**2.4**
Razorbill*	10.5	16.5	18,844	1979	19.8	3.8	0.83	**0.09**	**Yes**	0.0
Kittiwake*	14.6	15.4 - 46.3	28,078	4099	41.0	5.6	0.37 - **1.13**	**0.06 - 0.17**	**Yes**	0.06 to 0.18
East Caithness Cliffs SPA										
Guillemot	6.1	202.2	199,992	12200	122.0	40.0	**1.66**	**0.1**	**Yes**	**13.0**
Razorbill*	10.5	44.8	40,256	4227	42.3	8.1	**1.06**	**0.1**	**Yes**	0.7
Kittiwake*	14.6	53.9 - 161.7	48,920	7142	71.4	9.8	0.75 - **2.26**	**0.1 - 0.3**	**Yes**	0.1 to 0.3
North Caithness Cliffs SPA										
Guillemot	6.1	30.5	52,076	3177	31.8	10.4	0.96	**0.06**	**Yes**	**4.0**
Kittiwake*	14.6	6.3 - 19.0	11,136	1626	16.3	2.2	0.39 - **1.17**	**0.06 - 0.17**	**Yes**	0.01 to 0.03
Forth Islands SPA										

Site	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution to mortalities
Puffin*	9.4	39.4	10,229	962	9.6	2.0	**4.09**	**0.39**	**Yes**	0.2
Kittiwake*	14.6	7.3 - 22.0	7,162	1046	10.5	1.4	0.7 - **2.1**	**0.1 - 0.3**	**Yes**	0.01 to 0.03
Gannet*	8.1	75.2 - 107.3	150,518	12192	121.9	30.1	0.6 - 0.9	**0.05 - 0.07**	**Yes**	0.3 to 0.5
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	4.9 - 14.6	9,200	1343	13.4	1.8	0.37 - **1.09**	**0.05 - 0.16**	**Yes**	0.01 to 0.03
West Westray SPA										
Kittiwake*	14.6	6.4 - 19.1	5,510	804	8.0	1.1	0.80 - **2.37**	**0.12 - 0.35**	**Yes**	0.02 to 0.05
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	11.7 - 15.7	51,160	4144	41.4	10.2	0.28 - 0.38	**0.02 - 0.03**	**Yes**	0.07 to 0.1

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 37 In-combination projects predicted impacts from collision when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake*	14.6	67.8	22,590	3298	33.0	4.5	**2.06**	**0.300**	**Yes**	0.7
Troup, Pennan and Lion's Head SPA										
Kittiwake*	14.6	59.1	21,232	3100	31.0	4.2	**1.91**	**0.278**	**Yes**	0.6
Fowlsheugh SPA										
Kittiwake*	14.6	144.4	28,078	4099	41.0	5.6	**3.52**	**0.514**	**Yes**	0.4
East Caithness Cliffs SPA										
Kittiwake*	14.6	227.6	48,920	7142	71.4	9.8	**3.19**	**0.465**	**Yes**	0.7
North Caithness Cliffs SPA										
Kittiwake*	14.6	37.9	11,136	1626	16.3	2.2	**2.33**	**0.340**	**Yes**	0.1
Forth Islands SPA										
Kittiwake*	14.6	47.2	7,162	1046	10.5	1.4	**4.50**	**0.659**	**Yes**	0.1
Gannet	8.1	662.8	150,518	12192	121.9	30.1	**5.44**	**0.440**	**Yes**	**5.5**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	211.9	9,200	1343	13.4	1.8	**15.78**	**2.303**	**Yes**	0.1
West Westray SPA										
Kittiwake*	14.6	40.5	5,510	804	8.0	1.1	**5.03**	**0.735**	**Yes**	0.1
Hermaness, Saxa Vord and Valla Field SPA										

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Gannet*	8.1	61.8	51,160	4144	41.4	10.2	**1.49**	**0.121**	**Yes**	0.8

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 38. In-combination projects predicted impacts from collision (without Berwick Bank) when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake*	14.6	57.7	22,590	3298	33.0	4.5	**1.75**	**0.255**	**Yes**	0.7
Troup, Pennan and Lion's Head SPA										
Kittiwake*	14.6	50.6	21,232	3100	31.0	4.2	**1.63**	**0.238**	**Yes**	0.6
Fowlsheugh SPA										
Kittiwake*	14.6	76.3	28,078	4099	41.0	5.6	**1.86**	**0.272**	**Yes**	0.4
East Caithness Cliffs SPA										
Kittiwake*	14.6	209.2	48,920	7142	71.4	9.8	**2.93**	**0.428**	**Yes**	0.7
North Caithness Cliffs SPA										
Kittiwake*	14.6	33.4	11,136	1626	16.3	2.2	**2.05**	**0.300**	**Yes**	0.1
Forth Islands SPA										

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Kittiwake*	14.6	24.7	7,162	1046	10.5	1.4	**2.36**	**0.345**	**Yes**	0.1
Gannet	8.1	540	150,518	12192	121.9	30.1	**4.43**	**0.359**	**Yes**	**5.5**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	16.4	9,200	1343	13.4	1.8	**1.22**	**0.178**	**Yes**	0.1
West Westray SPA										
Kittiwake*	14.6	35.1	5,510	804	8.0	1.1	**4.36**	**0.637**	**Yes**	0.1
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	60.5	51,160	4144	41.4	10.2	**1.46**	**0.118**	**Yes**	0.8

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 39. In-combination projects predicted impacts from collision and displacement combined when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake	14.6	76.8 - 94.7	22,590	3298	33.0	4.5	**2.3 - 2.9**	**0.34 - 0.42**	**Yes**	0.8 - **1.0**
Troup, Pennan and Lion's Head SPA										
Kittiwake*	14.6	72.7 - 99.9	21,232	3100	31.0	4.2	**2.3 - 3.2**	**0.34 - 0.47**	**Yes**	0.7 - 0.8
Fowlsheugh SPA										
Kittiwake*	14.6	170.6 - 222.8	28,078	4099	41.0	5.6	**4.2 - 5.4**	**0.61 - 0.79**	**Yes**	0.5 - 0.6
East Caithness Cliffs SPA										
Kittiwake	14.6	286.7 - 404.9	48,920	7142	71.4	9.8	**4.0 - 5.7**	**0.59 - 0.83**	**Yes**	0.8 - **1.0**
North Caithness Cliffs SPA										
Kittiwake*	14.6	45.5 - 60.8	11,136	1626	16.3	2.2	**2.8 - 3.7**	**0.41 - 0.55**	**Yes**	0.1 - 0.1
Forth Islands SPA										
Kittiwake*	14.6	58.1 - 79.9	7,162	1046	10.5	1.4	**5.6 - 7.6**	**0.81 - 1.12**	**Yes**	0.1 - 0.1
Gannet	8.1	757.1 - 798.4	150,518	12192	121.9	30.1	**6.2 - 6.6**	**0.50 - 0.53**	**Yes**	**5.8 - 6.0**
St Abb's Head to Fast Castle SPA										

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Kittiwake*	14.6	246.4 - 314.9	9,200	1343	13.4	1.8	**18.4 - 23.5**	**2.68 - 3.42**	**Yes**	0.11 - 0.13
West Westray SPA										
Kittiwake*	14.6	48.4 - 64.2	5,510	804	8.0	1.1	**6.0 - 8.0**	**0.88 - 1.16**	**Yes**	0.12 - 0.15
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	74.1 - 78.4	51,160	4144	41.4	10.2	**1.8 - 1.9**	**0.1545 - 0.153**	**Yes**	0.87 - 0.90

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 40. In-combination projects predicted impacts from collision and displacement combined (without Berwick Bank) when considering the 'Applicant's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake	14.6	64.4 - 77.8	22,590	3298	33.0	4.5	**1.9 - 2.3**	**0.29 - 0.34**	**Yes**	0.8 - **1.0**
Troup, Pennan and Lion's Head SPA										
Kittiwake*	14.6	61.9 - 84.9	21,232	3100	31.0	4.2	**2.0 - 2.7**	**0.29 - 0.40**	**Yes**	0.7 - 0.8
Fowlsheugh SPA										
Kittiwake*	14.6	91.6 - 122.58	28,078	4099	41.0	5.6	**2.2 - 3.0**	**0.33 - 0.44**	**Yes**	0.5 - 0.6
East Caithness Cliffs SPA										
Kittiwake	14.6	263.1 - 370.9	48,920	7142	71.4	9.8	**3.7 - 5.2**	**0.54 - 0.76**	**Yes**	0.8 - **1.0**
North Caithness Cliffs SPA										
Kittiwake*	14.6	39.7 - 52.4	11,136	1626	16.3	2.2	**2.4 - 3.2**	**0.36 - 0.47**	**Yes**	0.1 - 0.1
Forth Islands SPA										
Kittiwake*	14.6	32.0 - 46.7	7,162	1046	10.5	1.4	**3.1 - 4.5**	**0.45 - 0.65**	**Yes**	0.1 - 0.1
Gannet	8.1	615.22 - 647.25	150,518	12192	121.9	30.1	**5.1 - 5.3**	**0.41 - 0.43**	**Yes**	**5.8 - 6.0**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	21.3 - 31.0	9,200	1343	13.4	1.8	**1.6 - 2.3**	**0.23 - 0.34**	**Yes**	0.11 - 0.13
West Westray SPA										
Kittiwake*	14.6	41.5 - 54.2	5,510	804	8.0	1.1	**5.2 - 6.7**	**0.75 - 0.98**	**Yes**	0.12 - 0.15

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	72.2 - 76.2	51,160	4144	41.4	10.2	**1.7 - 1.8**	**0.14 - 0.15**	**Yes**	0.87 - 0.90

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

5.4.2 In-combination impacts using SNCB's approach

Table 41. In-combination projects predicted impacts from displacement when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Guillemot	6.1	35.4 - 68.8	45,067	2749	27.5	9.0	**1.3 - 2.5**	**0.08 - 0.15**	**Yes**	**15.9 - 28.2**
Kittiwake*	14.6	9.0 - 26.9	22,590	3298	33.0	4.5	0.3 - 0.8	**0.04 - 0.12**	**Yes**	0.1 - 0.3
Troup, Pennan and Lion's Head SPA										
Guillemot	6.1	28.6 - 59.3	31,893	1945	19.5	6.4	**1.5 - 3.1**	**0.09 - 0.19**	**Yes**	**6.3 - 11.8**
Razorbill	10.5	6.7 - 16.9	6,054	636	6.4	1.2	**1.1 - 2.7**	**0.111 - 0.279**	**Yes**	0.7 - **1.2**
Kittiwake*	14.6	13.6 - 40.8	21,232	3100	31.0	4.2	0.4 - **1.3**	**0.06 - 0.19**	**Yes**	0.08 - 0.24
Fowlsheugh SPA										
Guillemot	6.1	433.1 - 808.5	93,570	5708	57.1	18.7	**7.6 - 14.2**	**0.46 - 0.86**	**Yes**	**2.9 - 8.6**
Razorbill*	10.5	57.3 - 106.8	18,844	1979	19.8	3.8	**2.9 - 5.4**	**0.3 - 0.6**	**Yes**	0.001 - 0.004
Kittiwake*	14.6	26.2 - 78.4	28,078	4099	41.0	5.6	0.6 - **1.9**	**0.09 - 0.28**	**Yes**	0.06 - 0.18
East Caithness Cliffs SPA										
Guillemot	6.1	647.5 - 1128.7	199,992	12200	122.0	40.0	**5.3 - 9.3**	**0.32 - 0.56**	**Yes**	**29 - 60**
Razorbill	10.5	115.5 - 232.6	40,256	4227	42.3	8.1	**2.7 - 5.5**	**0.29 - 0.58**	**Yes**	**2.54 - 4.24**
Kittiwake*	14.6	59.1 - 177.3	48,920	7142	71.4	9.8	0.8 - **2.5**	**0.12 - 0.36**	**Yes**	0.1 - 0.3
North Caithness Cliffs SPA										

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Guillemot	6.1	61.7 - 121.5	52,076	3177	31.8	10.4	**1.9 - 3.8**	**0.12 - 0.23**	**Yes**	**6.7 - 16.4**
Kittiwake*	14.6	7.6 - 22.9	11,136	1626	16.3	2.2	0.5 - **1.4**	**0.07 - 0.21**	**Yes**	0.01 - 0.03
Forth Islands SPA										
Puffin*	9.4	159.8 - 266.3	10,229	962	9.6	2.0	**16.6 - 27.7**	**1.56 - 2.60**	**Yes**	0.41 - 0.78
Kittiwake*	14.6	10.9 - 32.7	7,162	1046	10.5	1.4	**1.04 - 3.13**	**0.15 - 0.46**	**Yes**	0.02 - 0.03
Gannet	8.1	144.2 - 430.7	150,518	12192	121.9	30.1	**1.2 - 3.5**	**0.1 - 0.3**	**Yes**	0.47 - **1.4**
Copinsay SPA										
Guillemot	6.1	3.4 - 8.3	24,728	1508	15.1	4.9	0.2 - 0.6	0.014 - **0.034**	**Yes**	**1.8 - 3.6**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	34.5 - 103.0	9,200	1343	13.4	1.8	**2.6 - 7.7**	**0.38 - 1.12**	**Yes**	0.01 - 0.03
West Westray SPA										
Kittiwake*	14.6	7.9 - 23.7	5,510	804	8.0	1.1	0.98 - **2.94**	**0.14 - 0.43**	**Yes**	0.02 - 0.05
Sule Skerry and Sule Stack SPA										
Puffin	9.4	0.96 - 1.63	95,484	8975	89.8	19.1	0.01 - 0.02	0.001 - 0.002	No	0.86 - **1.43**
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	14.4 - 43.1	51,160	4144	41.4	10.2	0.4 - **1.0**	**0.03 - 0.08**	**Yes**	0.09 - 0.3

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 42. In-combination projects predicted impacts from displacement (without Berwick Bank) when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Guillemot	6.1	25.8 - 47.3	45,067	2749	27.5	9.0	0.94 - **1.72**	**0.06 - 0.11**	**Yes**	**15.9 - 28.2**
Kittiwake*	14.6	6.7 - 20.1	22,590	3298	33.0	4.5	0.2 - 0.6	**0.03 - 0.09**	**Yes**	0.1 - 0.3
Troup, Pennan and Lion's Head SPA										
Guillemot	6.1	23.4 - 48.2	31,893	1945	19.5	6.4	**1.2 - 2.5**	**0.07 - 0.15**	**Yes**	**6.3 - 11.8**
Razorbill	10.5	5.3 - 13.6	6,054	636	6.4	1.2	0.8 - **2.1**	**0.09 - 0.23**	**Yes**	0.7 - **1.2**
Kittiwake*	14.6	11.4 - 34.3	21,232	3100	31.0	4.2	0.4 - **1.1**	**0.05 - 0.16**	**Yes**	0.08 - 0.24
Fowlsheugh SPA										
Guillemot	6.1	173.2 - 335.2	93,570	5708	57.1	18.7	**3.03 - 5.87**	**0.19 - 0.36**	**Yes**	**2.9 - 8.6**
Razorbill*	10.5	44.6 - 83.8	18,844	1979	19.8	3.8	**2.25 - 4.24**	**0.24 - 0.45**	**Yes**	0.001 - 0.004
Kittiwake*	14.6	15.4 - 46.3	28,078	4099	41.0	5.6	0.37 - **1.13**	**0.06 - 0.17**	**Yes**	0.06 - 0.18
East Caithness Cliffs SPA										

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Guillemot	6.1	647.5 - 1128.7	199,992	12200	122.0	40.0	**5.31 - 9.25**	**0.32 - 0.56**	**Yes**	**29 - 60**
Razorbill	10.5	110.2 - 217.8	40,256	4227	42.3	8.1	**2.6 - 5.2**	**0.27 - 0.54**	**Yes**	**2.54 - 4.24**
Kittiwake	14.6	53.9 - 161.7	48,920	7142	71.4	9.8	0.8 - **2.3**	**0.11 - 0.33**	**Yes**	0.1 - 0.3
North Caithness Cliffs SPA										
Guillemot	6.1	61.7 - 121.5	52,076	3177	31.8	10.4	**1.9 - 3.8**	**0.12 - 0.23**	**Yes**	**6.7 - 16.4**
Kittiwake*	14.6	6.31 - 19.0	11,136	1626	16.3	2.2	0.4 - **1.2**	**0.06 - 0.17**	**Yes**	0.01 - 0.03
Forth Islands SPA										
Puffin*	9.4	141.61 - 236.1	10,229	962	9.6	2.0	**14.7 - 24.6**	**1.38 - 2.31**	**Yes**	0.41 - 0.78
Kittiwake*	14.6	7.31 - 22.0	7,162	1046	10.5	1.4	0.7 - **2.1**	**0.1 - 0.3**	**Yes**	0.02 - 0.03
Gannet	8.1	112.07 - 336.5	150,518	12192	121.9	30.1	0.9 - **2.8**	**0.07 - 0.22**	**Yes**	0.47 - **1.4**
Copinsay SPA										
Guillemot	6.1	3.4 - 8.3	24,728	1508	15.1	4.9	0.2 - 0.6	0.01 - **0.03**	**Yes**	**1.8 - 3.6**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	4.9 - 14.6	9,200	1343	13.4	1.8	0.37 - **1.09**	**0.05 - 0.16**	**Yes**	0.01 - 0.03
West Westray SPA										
Kittiwake*	14.6	6.4 - 19.1	5,510	804	8.0	1.1	0.8 - **2.4**	**0.12 - 0.35**	**Yes**	0.02 - 0.05
Sule Skerry and Sule Stack SPA										
Puffin	9.4	0.96 - 1.63	95,484	8975	89.8	19.1	0.01 - 0.02	0.001 - 0.002	No	0.86 - **1.43**

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	13.6 - 40.8	51,160	4144	41.4	10.2	0.3 - **1.0**	**0.03 - 0.08**	**Yes**	0.09 - 0.3

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 43. In-combination projects predicted impacts from collision when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake	14.6	72.3 - 72.4	22,590	3298	33.0	4.5	**2.2 - 2.2**	**0.3 - 0.3**	**Yes**	**1.0 - 1.1**
Troup, Pennan and Lion's Head SPA										
Kittiwake*	14.6	62.8 - 62.9	21,232	3100	31.0	4.2	**2.03 - 2.03**	**0.3 - 0.3**	**Yes**	0.8 - 0.9
Fowlsheugh SPA										
Kittiwake*	14.6	174.9 - 175.0	28,078	4099	41.0	5.6	**4.3 - 4.3**	**0.6 - 0.6**	**Yes**	0.6 - 0.7
East Caithness Cliffs SPA										
Kittiwake	14.6	235.2 - 235.4	48,920	7142	71.4	9.8	**3.3 - 3.3**	**0.5 - 0.5**	**Yes**	**1.1 - 1.3**

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
North Caithness Cliffs SPA										
Kittiwake*	14.6	39.7 - 39.8	11,136	1626	16.3	2.2	**2.4 - 2.5**	**0.4 - 0.4**	**Yes**	0.2 - 0.3
Forth Islands SPA										
Kittiwake*	14.6	57.3 - 57.3	7,162	1046	10.5	1.4	**5.5 - 5.5**	**0.8 - 0.8**	**Yes**	0.1 - 0.1
Gannet	8.1	691.7 - 691.7	150,518	12192	121.9	30.1	**5.7 - 5.7**	**0.5 - 0.5**	**Yes**	**6.2 - 6.2**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	299.6 - 299.7	9,200	1343	13.4	1.8	**22.3 - 22.3**	**3.26 - 3.26**	**Yes**	0.1 - 0.2
West Westray SPA										
Kittiwake*	14.6	42.7 - 42.7	5,510	804	8.0	1.1	**5.3 - 5.3**	**0.78 - 0.78**	**Yes**	0.2 - 0.2
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	62.4 - 62.4	51,160	4144	41.4	10.2	**1.5 - 1.5**	**0.12 - 0.12**	**Yes**	0.9 - 0.9

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 44. In-combination projects predicted impacts from collision (without Berwick Bank) when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake	14.6	58.0 - 58.1	22,590	3298	33.0	4.5	**1.76 - 1.76**	**0.26 - 0.26**	**Yes**	**1.0 - 1.1**
Troup, Pennan and Lion's Head SPA										
Kittiwake*	14.6	50.9 - 51.0	21,232	3100	31.0	4.2	**1.64 - 1.65**	**0.24 - 0.24**	**Yes**	0.8 - 0.9
Fowlsheugh SPA										
Kittiwake*	14.6	76.6 - 76.7	28,078	4099	41.0	5.6	**1.87 - 1.87**	**0.27 - 0.27**	**Yes**	0.6 - 0.7
East Caithness Cliffs SPA										
Kittiwake	14.6	209.7 - 209.9	48,920	7142	71.4	9.8	**2.94 - 2.94**	**0.43 - 0.43**	**Yes**	**1.1 - 1.3**
North Caithness Cliffs SPA										
Kittiwake*	14.6	33.4 - 33.5	11,136	1626	16.3	2.2	**2.05 - 2.06**	**0.3 - 0.3**	**Yes**	0.2 - 0.3
Forth Islands SPA										
Kittiwake*	14.6	24.8 - 24.8	7,162	1046	10.5	1.4	**2.4 - 2.4**	**0.35 - 0.35**	**Yes**	0.1 - 0.1
Gannet	8.1	540.6 - 540.6	150,518	12192	121.9	30.1	**4.43 - 4.43**	**0.36 - 0.36**	**Yes**	**6.2 - 6.2**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	16.5 - 16.6	9,200	1343	13.4	1.8	**1.23 - 1.24**	**0.18 - 0.18**	**Yes**	0.1 - 0.2
West Westray SPA										
Kittiwake*	14.6	35.3 - 35.3	5,510	804	8.0	1.1	**4.39 - 4.39**	**0.64 - 0.64**	**Yes**	0.2 - 0.2

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Hermaness, Saxa Vord and Valla Field SPA										
Gannet*	8.1	60.6 - 60.6	51,160	4144	41.4	10.2	**1.46 - 1.46**	**0.12 - 0.12**	**Yes**	0.9 - 0.9

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 45. In-combination projects predicted impacts from collision and displacement combined when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake	14.6	81.3 - 99.3	22,590	3298	33.0	4.5	**2.5 - 3.0**	**0.36 - 0.44**	**Yes**	**1.1 - 1.4**
Troup, Pennan and Lion's Head SPA										
Kittiwake	14.6	76.4 - 103.7	21,232	3100	31.0	4.2	**2.5 - 3.4**	**0.36 - 0.49**	**Yes**	0.9 - **1.1**
Fowlsheugh SPA										
Kittiwake*	14.6	201.1 - 253.4	28,078	4099	41.0	5.6	**4.9 - 6.2**	**0.72 - 0.90**	**Yes**	0.7 - 0.9
East Caithness Cliffs SPA										
Kittiwake	14.6	294.3 - 412.7	48,920	7142	71.4	9.8	**4.1 - 5.8**	**0.60 - 0.84**	**Yes**	**1.2 - 1.6**

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
North Caithness Cliffs SPA										
Kittiwake*	14.6	47.3 - 62.7	11,136	1626	16.3	2.2	**2.9 - 3.9**	**0.43 - 0.56**	**Yes**	0.2 - 0.3
Forth Islands SPA										
Kittiwake*	14.6	68.2 - 90.0	7,162	1046	10.5	1.4	**6.5 - 8.6**	**0.95 - 1.26**	**Yes**	0.14 - 0.18
Gannet	8.1	835.9 - 1122.4	150,518	12192	121.9	30.1	**6.9 - 9.2**	**0.56 - 0.75**	**Yes**	**6.7 - 7.6**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	334.1 - 402.7	9,200	1343	13.4	1.8	**24.9 - 30.0**	**3.6 - 4.4**	**Yes**	0.1 - 0.2
West Westray SPA										
Kittiwake*	14.6	50.6 - 66.4	5,510	804	8.0	1.1	**6.3 - 8.3**	**0.9 - 1.2**	**Yes**	0.22 - 0.25
Hermaness, Saxa Vord and Valla Field SPA										
Gannet	8.1	76.8 - 105.5	51,160	4144	41.4	10.2	**1.9 - 2.6**	**0.15 - 0.21**	**Yes**	0.99 - **1.20**

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

Table 46. In-combination projects predicted impacts from collision and displacement (without Berwick Bank) combined when considering the 'SNCB's Approach'.

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA										
Kittiwake*	14.6	64.7 - 78.2	22,590	3298	33.0	4.5	**1.96 - 2.37**	**0.29 - 0.35**	**Yes**	**1.1 - 1.4**
Troup, Pennan and Lion's Head SPA										
Kittiwake	14.6	62.3 - 85.3	21,232	3100	31.0	4.2	**2.01 - 2.75**	**0.29 - 0.40**	**Yes**	0.9 - **1.1**
Fowlsheugh SPA										
Kittiwake*	14.6	92.0 - 123.0	28,078	4099	41.0	5.6	**2.24 - 3.00**	**0.33 - 0.44**	**Yes**	0.7 - 0.9
East Caithness Cliffs SPA										
Kittiwake	14.6	263.6 - 371.6	48,920	7142	71.4	9.8	**3.69 - 5.20**	**0.54 - 0.76**	**Yes**	**1.2 - 1.6**
North Caithness Cliffs SPA										
Kittiwake*	14.6	39.7 - 52.5	11,136	1626	16.3	2.2	**2.44 - 3.23**	**0.36 - 0.47**	**Yes**	0.2 - 0.3
Forth Islands SPA										
Kittiwake*	14.6	32.1 - 46.8	7,162	1046	10.5	1.4	**3.1 - 4.5**	**0.45 - 0.65**	**Yes**	0.14 - 0.18
Gannet	8.1	652.7 - 877.1	150,518	12192	121.9	30.1	**5.35 - 7.19**	**0.43 - 0.58**	**Yes**	**6.7 - 7.6**
St Abb's Head to Fast Castle SPA										
Kittiwake*	14.6	21.4 - 31.2	9,200	1343	13.4	1.8	**1.59 - 2.33**	**0.23 - 0.34**	**Yes**	0.1 - 0.2
West Westray SPA										
Kittiwake*	14.6	41.7 - 54.4	5,510	804	8.0	1.1	**5.19 - 6.76**	**0.76 - 0.99**	**Yes**	0.22 - 0.25

Species	Adult Mortality Rate (%)	Annual Apportioned consequent mortality	Population size (breeding individuals)	Annual background mortality	1% increase in baseline mortality threshold	0.02 percentage point change in survival threshold	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Hermaness, Saxa Vord and Valla Field SPA										
Gannet	8.1	74.2 - 101.4	51,160	4144	41.4	10.2	**1.79 - 2.45**	**0.15 - 0.20**	**Yes**	0.99 - **1.20**

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Annual contribution from the Green Volt project to the in-combination impact is less than 1 bird.*

5.5 Summary In-Combination Impacts

5.5.1 Applicant's Approach

Assessments undertaken using the Applicant's Approach, when considering impacts from displacement, indicated in-combination impacts to all features from designated sites to have reached the threshold for undertaking further assessment using PVA, as shown in **Table 35** and **Table 36**. However, the contribution from the Project was less than one bird in the majority of the assessments, with the exception for guillemot at all sites. Further assessment of contributions of less than one bird from the Project to the in-combination impacts with other projects would usually be considered unnecessary as there will be no tangible contribution to the in-combination impact. However, as requested during consultation (see **Table 1**, item 14) all sites and features have been taken through for further assessment using PVA.

Assessments undertaken using the Applicant's Approach, when considering impacts from collision, indicated in-combination impacts to all features and designated sites to have reached the threshold for undertaking further assessment using PVA as shown in **Table 37** and

Table 38. However, the contribution from the Green Volt project was less than one bird for all the assessments, with the exception for gannet at the Forth Islands SPA.

Assessments undertaken using the Applicant's Approach, when considering impacts from displacement and collision combined, indicated in-combination impacts to all features from designated sites to have reached the threshold for undertaking further assessment using PVA as shown in **Table 39** and **Table 40**. However, the contribution from the Project was less than one bird in the majority of the assessments. The exceptions were for gannet at the Forth Islands SPA and kittiwake at Buchan Ness to Collieston Coast SPA and East Caithness Cliffs SPA, in which the contribution from the Project for kittiwake is 0.8-1.0 birds for both sites. However, the contribution from the Project is likely to be less than one bird (kittiwake) for these sites, as no consideration has been provided for macro-avoidance for when impacts from collision and displacement are to combined.

Using the Applicant's Approach the features from designated sites considered for further assessment using PVA and having a contribution of one bird or more are shown in **Table 47**. When considering contributions from the Project of less than one bird, effects of this magnitude represent a proportion of a population that is so small that it is considered to be practically unmeasurable with any accuracy and, therefore, the Applicant considers there will be no tangible contribution to the in-combination impact and an AEoSI can be ruled out at this stage in the assessment.

Table 47. Sites and features with a contribution from the Project of one bird or more to the in-combination impact which the Applicant considers further assessment is required.

Species	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution to mortalities
Buchan Ness to Collieston Coast SPA				
Guillemot	0.51	**0.031**	**Yes**	**5.1**
Troup, Pennan and Lion's Head SPA				
Guillemot	0.66	**0.040**	**Yes**	**2.3**
Fowlsheugh SPA				
Guillemot	**2.70**	**0.167**	**Yes**	**2.4**
East Caithness Cliffs SPA				
Guillemot	**1.66**	**0.101**	**Yes**	**13.0**
North Caithness Cliffs SPA				
Guillemot	0.96	**0.059**	**Yes**	**4.0**
Forth Islands SPA				
Gannet	**6.2 - 6.6**	**0.50 - 0.53**	**Yes**	**5.8 - 6.0**

Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA.

Further assessment of contributions of less than one bird from the Project to the in-combination impacts with other projects would usually be considered unnecessary as there will be no tangible contribution to the in-combination impact. However, as requested during consultation (see **Table 1**, item 14) all features have been taken through for further assessment using PVA as presented in **Table 35** to **Table 40**..

5.5.2 SNCB's Approach

Assessments undertaken using the SNCB's Approach, when considering impacts from displacement, indicated in-combination impacts to features from designated sites to have reached the threshold for undertaking further assessment using PVA as shown in **Table 41** and **Table 42,** with the exception of puffin at Sule Skerry and Sule Stack SPA. However, the contribution from the Project was less than one bird in the majority of the assessments. The exceptions were for guillemot at all sites, razorbill at two sites; Troup, Pennan and Lion's Head SPA and East Caithness Cliffs SPA, and gannet at Forth Islands SPA. Further assessment of contributions of less than one bird from the Project to the in-combination impacts with other projects would usually be considered unnecessary as there will be no tangible contribution to the in-combination impact. However, as requested during consultation (see **Table 1,** item 14) all sites and features have been taken through for further assessment using PVA.

Assessments undertaken using the SNCB's Approach, when considering impacts from collision, indicated in-combination impacts to all sites and features to have reached the threshold for undertaking further assessment using PVA as shown in

Table 43 and **Table 44**. However, the contribution from the Project was less than one bird for all the assessments. The exceptions were for gannet at the Forth Islands SPA and kittiwake at Buchan Ness to Collieston Coast SPA and East Caithness Cliffs SPA, in which the contribution from the Project for kittiwake is 1.0-1.1 and 1.1 – 1.3 birds, respectively.

Assessments undertaken using the SNCB's Approach, when considering impacts from displacement and collision combined, indicated in-combination impacts to all features from designated sites to have reached the threshold for undertaking further assessment using PVA as shown in

Table 45 and **Table 46.** However, the contribution from the Project was less than one bird in the majority of the assessments. The exceptions were for: gannet at the Forth Islands SPA and Hermaness, Saxa Vord and Valla Field SPA, in which the contribution from the Project for gannet are 6.7-7.6 and 1.0 – 1.2 birds, respectively. In addition, kittiwake at the Buchan Ness to Collieston Coast SPA, Troup, Pennan and Lion's Head SPA and East Caithness Cliffs SPA in which the contribution from the Project for kittiwake are 1.1-1.4, 0.9 – 1.1 and 1.2 – 1.6 birds, respectively.

The contribution from the Project is likely to considerably less than predicted for gannet as no consideration has been made for macro-avoidance when impacts from collision risk and displacement are combined. It is, therefore, likely that the contribution from the Project to gannet mortalities in-combination with other projects is less than one bird for Hermaness, Saxa Vord and Valla Field SPA. The same principal applies to kittiwake if impacts from collision risk and displacement are to be combined. It is, therefore, likely that the contribution from the Project to kittiwake mortalities in-combination with other projects to be less than one bird, as even when considering the SNCB's upper impact rates the contribution from the Project does not exceed more than one bird.

Using the SNCB's Approach the features and designated sites considered for further assessment using PVA and having a contribution of one bird or more are shown in **Table 48**. When considering contributions from the Project of less than one bird, effects of this magnitude represent a proportion of a population that is so small that it is considered to be practically unmeasurable with any accuracy and, therefore, the Applicant considers there will be no tangible contribution to the in-combination impact and an AEoSI can be ruled out at this stage in the assessment.

Table 48. Sites and features with a contribution from the Project of one bird or more to the in-combination impact which the Applicant considers further assessment is required.

Species	Increase in baseline mortality (%)	Percentage point change in survival	Threshold reached for undertaking PVA (≥0.02)	Green Volt Contribution
Buchan Ness to Collieston Coast SPA				
Guillemot	**1.3 - 2.5**	**0.08 - 0.15**	**Yes**	**15.9 - 28.2**
Kittiwake*	**1.96 - 2.37**	**0.29 - 0.35**	**Yes**	**1.1 - 1.4**
Troup, Pennan and Lion's Head SPA				
Guillemot	**1.5 - 3.1**	**0.09 - 0.19**	**Yes**	**6.3 - 11.8**
Razorbill	**1.1 - 2.7**	**0.111 - 0.279**	**Yes**	0.7 - **1.2**
Kittiwake*	**2.01 - 2.75**	**0.29 - 0.40**	**Yes**	0.9 - **1.1**
Fowlsheugh SPA				
Guillemot	**7.6 - 14.2**	**0.46 - 0.86**	**Yes**	**2.9 - 8.6**
East Caithness Cliffs SPA				
Guillemot	**5.3 - 9.3**	**0.32 - 0.56**	**Yes**	**29 - 60**
Razorbill	**2.7 - 5.5**	**0.29 - 0.58**	**Yes**	**2.54 - 4.24**
Kittiwake*	**3.69 - 5.20**	**0.54 - 0.76**	**Yes**	**1.2 - 1.6**
North Caithness Cliffs SPA				
Guillemot	**1.9 - 3.8**	**0.12 - 0.23**	**Yes**	**6.7 - 16.4**
Forth Islands SPA				
Gannet	**5.35 - 7.19**	**0.43 - 0.58**	**Yes**	**6.7 - 7.6**
Copinsay SPA				
Guillemot	0.2 - 0.6	0.014 - **0.034**	**Yes**	**1.8 - 3.6**
Hermaness, Saxa Vord and Valla Field SPA				
Gannet*	**1.79 - 2.45**	**0.15 - 0.20**	**Yes**	0.99 - **1.20**

*Yellow highlighted cells indicate: % point change of ≥0.02 and/or an increase in baseline mortality of ≥1% and/ or a Green Volt contribution of ≥1 bird. Cells highlighted red indicate the sites and features taken through for PVA. *Indicates values are over-inflated as no account for macro-avoidance has been considered and realistically likely to be less than 1 bird.*

Further assessment of contributions of less than one bird from the Project to the in-combination impacts with other projects would usually be considered unnecessary as there will be no tangible contribution to the in-combination impact. However, as requested during consultation (see **Table 1**, item 14) all sites and features have been taken through for further assessment using PVA as presented in **Table 41** to **Table 46.**

6. Population Viability Analysis

6.1 Introduction

The collision and displacement effects estimated in **Sections 3-** have potential impacts on the population status of site features (i.e. different species) within the Project region. Impacts from OWFs which are considered to have the potential to cause collision and displacement effects are assessed to predict the scale of population level effects from the Project alone or in-combination with other OWFs. This allows for assessment of whether the proposed Project will significantly impact, or significantly contribute to an in-combined impact.

To understand and predict potential population-level effects it is typical to undertake population viability analysis (PVA) modelling for project alone or in-combination assessments of the predicted impacts. PVA provides a simplistic framework using demographic parameters to predict changes in the population, using statistical models to forecast future changes over a set period. Comparisons can then be made between unimpacted ('baseline') model and impacted models, which allow the theoretical differences between population status with and without the developments scoped into the overall assessment, informing the consent decision by directly relating impacts to the conservation objectives of the scoped in sites.

Previously, PVAs have been presented with the Project Offshore Report to Inform Appropriate Assessment (henceforth referred to as the Project RIAA) which provided outputs for PVA models ran with a range of impact values for each of the features the Applicant scoped in to the HRA. These impact values were selected by using the lowest estimated impact and increasing values to an estimated maximum, likely unrealistic impact. This approach was used to allow for assessing the estimated impacts, along with potential alternative scenarios of collision and displacement effects without the necessity to re-run a full scope of PVAs. Comments were received on this approach from NatureScot (**Section 2, Table 1**), with a request to scope in a larger number of sites and associated features and run PVAs using specified parameters including the SNCBs Approach upper and lower limits (**Table 27)**, Applicants Approach upper and lower limits (**Table 27**) for both the Project alone or in-combination where applicable.

The PVA and subsequent impact assessment conclusions in this report are undertaken for seabirds that are qualifying features of designated sites listed below. The 10 SPAs (with a total of 20 features) were selected for further assessment following comments from NatureScot on the Project RIAA. The threshold recommended to use by NatureScot was change in baseline survival rate of 0.02% points or more.

List of sites

- Buchan Ness to Collieston Coast SPA: guillemot and kittiwake
- Troup, Pennan and Lion's Head SPA: guillemot, razorbill, and kittiwake
- East Caithness Cliffs SPA: guillemot, razorbill, and kittiwake
- Forth Islands SPA: puffin, kittiwake, and gannet
- Fowlsheugh SPA: guillemot, razorbill, kittiwake
- Copinsay SPA: guillemot
- North Caithness Cliffs SPA: guillemot and kittiwake
- St Abbs's Head to Fast Castle SPA: kittiwake
- West Westray SPA: kittiwake
- Hermaness, Saxa Vord and Valla Field SPA: gannet

*Underline indicates features and sites included for further assessment using PVA compared to those assessed and presented in the Project RIAA.

Previously, the gannet population at Troup, Pennan and Lion's Head SPA was included in the analysis presented in the Project RIAA. This was initially included as since the citation of the site, where gannet was not a prominent feature, the population status has increased to represent more than 1% of the population. The Applicant therefore included the gannet feature of Troup, Pennan and Lion's Head SPA, however comments received from NatureScot indicate it is not required to be included and is therefore removed for this analysis (**Section 2, Table 1**).

The conclusions made on the potential for impacts on protected features (termed Adverse Effect on Site Integrity (AEoSI)) is made based on the consideration of a number of factors: 1) the PVA outputs; 2) the justification of collision, displacement and PVA parameter based on up to date evidence from existing sites; and 3) the predicted change within the context of the known population trends based on the Seabird Monitoring Programme (hence referred to as SMP) (SMP, 2022). The conclusions on the potential AEoSI of the features identified within the PVA analysis are summarised in **Conclusions and summary outputs** where the justification for the conclusions is discussed in detail.

6.2 Method

The PVA analysis was undertaken using the Seabird PVA Tool developed by Natural England (Searle et al., 2019). The Seabird PVA Tool is available through the 'Shiny App' online interface, which is a user-friendly graphical user interface version accessible via a standard web-browser that uses the nepva R package to perform the modelling and analysis. The advantages of using an online platform for modelling and analysis purposes are that users are not required to use any R code, users are not required to install or maintain R, and updates to the model are made

directly to the server. The tool can assess any type of impact in terms of change to demographic parameters, or as a cull or harvest of a fixed size per year (Searle et al., 2019).

6.2.1 Modelling approach

The Seabird PVA Tool (Searle et al. 2019) uses a Leslie matrix to construct a PVA model (Caswell, 2000) based on the parameters provided by the user. Users can specify whether they wish the model to include demographic stochasticity, environmental stochasticity, and either use density dependent or independent methods, or whether they want the model to run as entirely deterministic model. Additionally, the model offers the user pre-set demographic rates which are based on generic parameters such as Horswill & Robinson (2015) or site-specific growth rates from previous studies. The selection of appropriate parameters is critical to producing justifiable PVA outputs, with the selection of demographic parameters details in **Section 6.2.2**.

A deterministic model translates the demographic parameters provided into actual numbers and provides a simplistic model, which can be used to generate average trends. Due to the lack of stochasticity, a deterministic model will produce the same result every time the simulation is run. In situations where little is known about how the population size has varied, or how the scale of impact may vary, running a deterministic model might provide a more candid assessment of the population and how it may be impacted.

A stochastic model produces probabilistic outputs to account for the impact of environmental and demographic stochasticity. Environmental stochasticity describes the effects random variation in factors such as weather or viral outbreaks can have on a population and is modelled by the incorporation of randomly generated values, based on a set standard deviation, for the probability of survival from one-time step to the next. Demographic stochasticity refers to the effect of random variation in population structure on demographic rates and is modelled by generating random numbers of surviving individuals for any given survival probability. Demographic stochasticity can usually be ignored for populations greater than 100 individuals, however including demographic stochasticity will not cause any penalty when simulating larger populations (WWT Consulting, 2012).

Natural populations continually operate under density dependency, including nature mechanisms such as food resources which limit the growth rate and total size a population could obtain (theoretical carrying capacity). Demographic processes such as growth, survival, productivity and recruitment are density-dependent, as their rates change in relation to the number of individuals in a population. Density dependence can be described as being either compensatory or depensatory (Begon et al., 2005). Compensation is characterised by demographic changes that cause a stabilising effect on a populations long-term average. Depensation acts to further decrease the rate of population growth in declining populations and can delay the rate of recovery. This is typically exhibited in populations that have been significantly depleted in size and is caused by a reduction in the benefits associated with conspecific presence.

Density dependence is self-evident in the natural environment, as without density dependence, populations would grow exponentially. For seabird populations, the

mechanisms as to how this operates are largely uncertain, or where known is highly variable. This is especially noticeable in cases where population trends indicate meta-population dynamics may be present such as in the northern regions of Scotland for kittiwake, where populations have declined significantly over the years however are still maintained. If density dependence is mis-specified in an assessment, the modelled predictions would be unreliable. There have been some instances where density dependent methods have been used for assessment, however these are largely based on assumptions regarding the population stability and utility of information derived from other sites. As the populations in this assessment show highly varying trends with some in decline or poor data status, it is deemed density dependent methods are not appropriate for this assessment. Therefore, the more typical approach of using density independent models for seabird assessments, despite the lack of biologically realistic density dependence. Density independent models lack any means by which a population can recover once it has been reduced beyond a certain point, they are therefore appropriate for impact assessment purposes on the grounds of precaution (i.e., another source of precaution in the assessment process) as they are more likely to overestimate true impacts (Ridge *et al*. 2019).

6.2.2 PVA demographic parameters

The Seabird PVA Tool (Searle et al. 2019) has a Shiny App that offers the user the choice of using pre-set demographic parameters or the ability to enter custom values. The pre-set demographic values are available for a total of 15 different species. The values are derived from previously reported national or colony specific demographic parameters sourced from the Joint Nature Conservation Committee (JNCC) Seabird Monitoring Programme (SMP 2020). This data is further divided into eight regional classifications (Mobbs *et al*., (2020) for breeding success data or Horswill & Robinson (2015) for survival rate.

Following a review of the pre-formulated productivity rates within the Seabird PVA Tool (Searle et al. 2019) for the eight regional classifications, none of the pre-formulated values for productivity were representative of known population trends for those assessed within this report. This was due to the age of these data (productivity data spanning over 50 years in some instances) feeding into the productivity rates. Therefore, where possible, SPA-specific productivity values were calculated using breeding success from the SMP database and the associated colony count data. Average productivity rates (and associated standard deviations) were calculated using the datasets provided in the SMP database for the kittiwake feature of Buchan Ness to Collieston Coast SPA, Troup, Pennan and Lion's Head SPA and East Caithness Cliffs SPA. **Table 49** summarises the species-specific values selected for the five species that are the focus of this report.

The overall productivity was calculated as the mean of each year's colony counts for all the years SPA colony count data available. Where specific years had multiple counts, these were subject to a weighted mean approach to avoid bias towards productivity for a certain year. Due to the absence of site-specific productivity values for all guillemot colonies and for the gannet colony in the Forth Islands SPA, the national productivity rates presented within Horswill and Robinson (2015) were deemed the most appropriate for assessment for these PVA runs.

For all five species, the SPA population sizes are based on colony counts from the SMP database (JNCC, 2022), as shown in **Section 0**, **Table 13** to **Table 17**.

For the seabird colonies assessed there are currently no colony-specific survival rates available. In the absence of colony-specific survival rates all modelling relied on the pre-formulated national values presented within the Seabird PVA Tool (Searle *et al*., 2019). These pre-formulated values were derived from Horswill and Robinson (2015) and are deemed to be the most appropriate values in the absence of colony-specifics. The age at first breeding and maximum brood size per pair parameters were also selected from the pre-formulated values within the Seabird PVA Tool (Searle *et al*., 2019).

Table 49. SPA demographic parameters selected for guillemot, kittiwake and gannet

Species	Colony	SPA and numbers of colony breeding adults (Year)	Productivity rate ± SD	Mean adult survival rate + SD	Mean immature age class 0 – 1 survival rate + SD	Mean immature age class 1 – 2 survival rate + SD	Mean immature age class 2 – 3 survival rate + SD	Mean immature age class 3 – 4 survival rate + SD	Mean immature age class 4 – 5 survival rate + SD
Kittiwake	Buchan Ness to Collieston Coast SPA	22,590 (2017)	0.756 ± 0.257	0.854 ± 0.051	0.790 ± 0.000	0.854 ± 0.051	0.854 ± 0.051	0.854 ± 0.051	0.854 ± 0.051
	Troup, Pennan and Lion's Head SPA	21,232 (2017)	1.109 ± 0.252						
	East Caithness Cliffs SPA	48,920 (2016)	0.230 ± 0.025						
	Fowlsheugh SPA	28,078 (2018)	0.966 ± 0.327						
	North Caithness Cliffs	11,136 (2016)	National (0.69 ± 0.296) (Horswill & Robinson, 2015)						
	West Westray SPA	5,510 (2017)							
	St Abbs Head SPA	9,200 (2021)	0.859 ± 0.344						
	Forth Islands	7,702 (2022)	1.377 ± 0.000						

Species	Colony	SPA and numbers of colony breeding adults (Year)	Productivity rate ± SD	Mean adult survival rate + SD	Mean immature age class 0 – 1 survival rate + SD	Mean immature age class 1 – 2 survival rate + SD	Mean immature age class 2 – 3 survival rate + SD	Mean immature age class 3 – 4 survival rate + SD	Mean immature age class 4 – 5 survival rate + SD
Guillemot	Buchan Ness to Collieston Coast SPA	45,067 (2019)	0.672 ± 0.147	0.939 ± 0.015	0.560 ± 0.001	0.792 ± 0.001	0.917 ± 0.001	0.917 ± 0.001	0.939 ± 0.015
	Troup, Pennan and Lion's Head SPA	31,893 (2017)							
	East Caithness Cliffs SPA	199,922 (2016)							
	North Caithness Cliffs SPA	52,076 (2018)							
	Fowlsheugh SPA	93,570 (2018)							
	Copinsay SPA	24,728 (2015)							
Razorbill	Troup, Pennan and Lion's Head SPA	6,054 (2017)	0.570 ± 0.247	0.895 ± 0.067	0.630 ± 0.209	0.630 ± 0.209	0.895 ± 0.067	0.895 ± 0.067	0.895 ± 0.067
	Fowlsheugh SPA	18,884 (2018)							
	East Caithness Cliffs SPA	40,256 (2016)							
Puffin	Forth Islands SPA	10,229 (2018)	0.617 ± 0.151	0.906 ± 0.083	0.709 ± <0.001	0.709 ± <0.001	0.709 ± <0.001	0.760 ± <0.001	0.805 ± <0.001

Species	Colony	SPA and numbers of colony breeding adults (Year)	Productivity rate ± SD	Mean adult survival rate + SD	Mean immature age class 0 – 1 survival rate + SD	Mean immature age class 1 – 2 survival rate + SD	Mean immature age class 2 – 3 survival rate + SD	Mean immature age class 3 – 4 survival rate + SD	Mean immature age class 4 – 5 survival rate + SD
Gannet	Forth Islands	150,518 (2014)	0.919 ± 0.042	0.424 ± 0.045	0.424 ± 0.045	0.829 ± 0.026	0.891 ± 0.019	0.895 ± 0.019	0.895 ± 0.042
	Hermaness, Saxa Vord and Valla field SPA	51,160 (2014)							

6.3 Results

6.3.1 Introduction

Summarised below are the PVA outputs from the runs of the Natural England PVA tool. Three sets of outputs are presented for each species;

1. Project Alone SNCB approach where relevant;
2. In-combination displacement with and without Berwick Bank (for guillemot, razorbill and puffin only) for SNCB and Applicant approach; and
3. In-combination combined effects with and without Berwick Bank (for kittiwake and gannet) for SNCB and Applicant approach.

The outputs include model runs which used either the lower or upper range of parameter values estimated, as presented in each species-specific table below. Results are presented per species for each colony. Note, a range of values which cover the Applicant's Approach for the project alone assessment are presented in Annex A1: Offshore Ornithology Population Viability Analysis for HRA of the Project RIAA. Further, not all approaches are presented for all species, as in some cases the Applicant approach does not include an upper and a lower limit, or the approaches align and are presented as SNCB Approach.

The modelling approach to PVAs run can lead to large estimates of variability, with likely overlap between confidence interval outputs in both the Applicant's Approach and the SNCB's Approach. This is largely a trait of the PVA modelling method, as stochastic density independent models have no biological mechanisms to constrain an exponential trend of population growth (i.e., any form of density dependency). The lack of such a mechanism leads the counterfactual population size metric to be time sensitive, hence why the counterfactual growth rate metric should also be considered during assessment as greater diversions in population size from the unimpacted population are more likely the greater the model run time.

It is acknowledged, in some scenarios, that unimpacted-impacted model divergences may be the result of a true predicted impact. However, minimal real differences may be exaggerated by the demographic stochasticity within the PVA model itself. Including demographic stochasticity is the correct approach as advocated in the guidance (**Guidance Note 11**), however, in marginal circumstances this may affect the overall conclusions from the PVA analysis. Therefore, both the counterfactual growth rate and the counterfactual population size are presented for all runs. In addition, considering how the model fits with site-specific growth rate trends also allows for an estimation of the likely realism of the PVA models used to inform assessments.

6.3.2 Buchan Ness to Collieston Coast SPA

6.3.2.1 Project Alone

6.3.2.1.1 Guillemot

The potential for impacts resulting from displacement from the Project alone has been assessed against the latest 2017 SMP colony count population size of 45,067 breeding adults (JNCC, 2022). Two annual impact scenarios, an upper and lower, were assessed for the project alone following the SNCB's Approach. Therefore, the impact values assessed were of 15.9 and 28.2 adult mortalities per annum, respectively, within the PVA modelling.

The resulting PVA outputs (**Table 50**) for project alone impacts on the guillemot feature of Buchan Ness to Collieston Coast SPA were predicted as follows:

- Following the lower end of the SNCB's Approach the PVA indicated a potential 1% (at the 25-year point) and 1.4% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.990 and 0.986, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001); and
- Following the upper end of the SNCB's Approach the PVA indicated a potential 1.8% (at the 25-year point) and 2.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.982 and 0.975, respectively. For both 25-year and 35-year time periods the counterfactual growth rate decreased marginally to 0.999 (SD <0.001).

Table 50. PVA results using Seabird PVA Tool for impacts apportioned to the Buchan Ness to Collieston Coast SPA from the Project alone.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Alone (Lower)	0.00035	1.000 (<0.001)	0.990 (0.008)	1.000 (<0.001)	0.986 (0.009)
	SNCB	Alone (Upper)	0.00063	0.999 (<0.001)	0.982 (0.008)	0.999 (<0.001)	0.975 (0.009)

The average annual colony count growth rates for the guillemot feature of Buchan Ness to Collieston Coast SPA are presented in **Table 51**. Over the 30-year period presented, the guillemot population has grown at a rate of 3.14% per annum. When considering the population growth from 2007 to 2017, the annual compound growth rate increased to 5.71%, despite multiple OWFs being operational within the North Sea during that period. During the early 2000s a notable reduction in colony breeding success occurred across North Sea Scottish

colonies, which was suggested to have been caused by food shortages, particularly to species and colonies primarily reliant upon sandeels (Wanless *et al*., 2005). This correlates with the reduction in the annual colony growth rate between 2001 – 2017 (**Table 51**). As shown in the annual compound growth rate between 2007 – 2017, following the food shortages in the early 2000s, the colony's growth rate has quickly recovered. This highlights the resilience of the Buchan Ness to Collieston Coast SPA colony to changing external environmental factors.

Table 51. Annual colony compound growth rate for guillemot feature of the Buchan Ness to Collieston Coast SPA between 1986 – 2017

Species	Colony Annual Compound Growth Rate (%)		
	1986 - 2017	2001 - 2017	2007 - 2017
Guillemot	3.14	0.93	5.71

When considering the Project alone displacement impact on the guillemot population at the Buchan Ness to Collieston Coast SPA, there is a variability (as shown by the SD) in the counterfactual population size metric and a lack of variability in the counterfactual growth rate. Therefore, it is not expected that either scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of Buchan Ness to Collieston Coast SPA** in relation to displacement effects in the operation and maintenance phase from the Project alone. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

6.3.2.2 In-combination

6.3.2.2.1 Guillemot

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2019 SMP colony count population size of 45,067 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling;

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 35.40 additional adult mortalities per annum.
    b. Upper mortality rate of 68.80 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    - Mortality rate of 13.90 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 25.80 additional adult mortalities per annum.
    b. Upper mortality rate of 47.30 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    - Mortality rate of 9.00 additional adult mortalities per annum.

The resulting PVA outputs (**Table 52**) for the guillemot feature of Buchan Ness to Collieston Coast SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 2.3% (at the 25-year point) and 3.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.977 and 0.969, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.999.
    b. PVA indicated a potential 4.3% (at the 25-year point) and 5.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.957 and 0.941, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.998.
2. Applicant's Approach including Berwick Bank.
    - PVA indicated a potential 0.9% (at 25-year point) and 1.3% (at 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.991 and 0.987, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).
3. SNCB's Approach without Berwick Bank.
    a. PVA indicated a potential 1.7% (at 25-year point) and 2.3% (at 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.983 and 0.977, respectively. For both 25-

year and 35-year time periods the counterfactual growth rate did not decrease below 0.999.

b. PVA indicated a potential 3.2% (at 25-year point) and 4.4% (at 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.968 and 0.956, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.999.

4. Applicant's Approach without Berwick Bank.
   - PVA indicated a potential 0.6% (at the 25-year point) and 0.8% (at 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.994 and 0.992, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).

Table 52. PVA results using Seabird PVA Tool for impacts apportioned to the Buchan Ness to Collieston Coast SPA guillemot population showing displacement In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Displacement inc. Berwick Bank (Lower)	0.00079	0.999 (<0.001)	0.977 (0.008)	0.999 (<0.001)	0.969 (0.009)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00153	0.998 (<0.001)	0.957 (0.008)	0.998 (<0.001)	0.941 (0.009)
	Applicant	Displacement inc. Berwick Bank	0.00031	1.000 (<0.001)	0.991 (0.008)	1.000 (<0.001)	0.987 (0.009)
	SNCB	Displacement excl. Berwick Bank (Lower)	0.00057	0.999 (<0.001)	0.983 (0.008)	0.999 (<0.001)	0.977 (0.009)
	SNCB	Displacement excl. Berwick Bank (Upper)	0.00105	0.999 (<0.001)	0.968 (0.008)	0.999 (<0.001)	0.956 (0.009)
	Applicant	Displacement excl. Berwick Bank	0.00020	1.000 (<0.001)	0.994 (0.008)	1.000 (<0.001)	0.992 (0.009)

Following analysis of the range of outputs from the in-combination PVAs for the guillemot feature of the Buchan Ness to Collieston Coast SPA they are largely indicative of minimal reductions (**Table 52**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 5.9% reduction in population size after 35 years, with decrease in growth rate of just 0.2%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB's Approach

(MacArthur Green, 2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 2.3% reduction in population size after 35 years.

Colony-specific population growth trends for guillemot show a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005) (**Table 51**). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.01% (5.1 birds) (**Table 35**) of the Buchan Ness to Collieston Coast SPA population of 45,067. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to the population reduction predicted, with or without Berwick Bank.

When considering the displacement impacts from the Project in-combination with other plans and projects on the guillemot feature of the Buchan Ness to Collieston Coast SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of Buchan Ness to Collieston Coast SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.2.2.2 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 22,590 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 81.30 adult mortalities per annum.
    b. Upper mortality rate of 99.30 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 76.80 adult mortalities per annum.
    b. Upper mortality rate of 94.70 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 64.70 additional adult mortalities per annum.
    b. Upper mortality rate of 78.20 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 64.40 adult mortalities per annum.
    b. Upper mortality rate of 77.80 additional adult mortalities per annum.

The PVA outputs (**Table 53**) for the kittiwake feature of Buchan Ness to Collieston Coast SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 10.5% (at the 25-year point) and 14.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.895 and 0.857, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 12.7% (at the 25-year point) and 17.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.873 and 0.828, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 9.9% (at the 25-year point) and 13.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.901 and 0.865, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 12.2% (at the 25-year point) and 12.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.878 and 0.836, respectively. For

both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 8.5% (at the 25-year point) and 11.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.915 and 0.884, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.997.
    b. PVA indicated a potential 10.2% (at the 25-year point) and 13.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.898 and 0.862, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 8.6% (at the 25-year point) and 11.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.914 and 0.884, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 9.9% (at the 25-year point) and 13.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.901 and 0.865, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.

Table 53. PVA results using Seabird PVA Tool for impacts apportioned to the Buchan Ness to Collieston Coast SPA kittiwake population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.00360	0.996 (0.001)	0.895 (0.014)	0.996 (0.000)	0.857 (0.014)
	SNCB	Combination inc. Berwick Bank (Upper)	0.00440	0.995 (0.001)	0.873 (0.013)	0.995 (0.000)	0.828 (0.014)
	Appl.	Combination inc. Berwick Bank (Lower)	0.00340	0.996 (0.001)	0.901 (0.014)	0.996 (0.000)	0.865 (0.014)
	Appl.	Combination inc. Berwick Bank (Upper)	0.00419	0.995 (0.001)	0.878 (0.014)	0.995 (0.000)	0.836 (0.014)
	SNCB	Combination excl. Berwick Bank (Lower)	0.00286	0.997 (0.001)	0.915 (0.014)	0.997 (0.000)	0.884 (0.015)
	SNCB	Combination excl. Berwick Bank (Upper)	0.00346	0.996 (0.001)	0.898 (0.014)	0.996 (0.000)	0.862 (0.014)
	Appl.	Combination excl. Berwick Bank (Lower)	0.00285	0.997 (0.001)	0.914 (0.014)	0.997 (0.000)	0.884 (0.015)
	Appl.	Combination Excl. Berwick Bank (Upper)	0.00344	0.996 (0.001)	0.901 (0.014)	0.996 (0.000)	0.865 (0.015)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the Buchan Ness to Collieston Coast SPA they are potentially indicative of moderate reductions (**Table 52**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 17.2% reduction in population size after 35 years, with decrease in growth rate of just 0.5%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 12.3% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show a declining population but with improving growth rates, likely associated with prey resources (Wanless *et al*., 2005). While still indicating slight current declines, growth rates have improved by 0.77%. With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely.

Table 54. Annual colony compound growth rate for kittiwake feature of the Buchan Ness to Collieston Coast SPA between 1986 – 2017

Species	Colony Annual Compound Growth Rate (%)		
	1986 - 2017	2001 - 2017	2007 - 2017
Kittiwake	-1.64%	-1.10%	-0.87%

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.004% (1 bird) (**Table 35**) of the Buchan Ness to Collieston Coast SPA population of 22,590 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving growth rates (-1.64% – -0.87%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the Buchan Ness to Collieston Coast SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of Buchan Ness to Collieston Coast SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.3 Troup, Pennan and Lion's Head SPA

6.3.3.1 Project Alone

6.3.3.1.1 Guillemot

The potential for impacts resulting from displacement from the Project alone has been assessed against the latest 2017 SMP colony count population size of 31,893 breeding adults (JNCC, 2022). Two annual impact scenarios, an upper and lower, were assessed for the Project alone following the SNCB's Approach. Therefore, the impact values assessed were of 6.3 and 11.8 adult mortalities per annum, respectively, within the PVA modelling.

The resulting PVA outputs (**Table 55**) for project alone impacts on the guillemot feature of Troup, Pennan and Lion's Head SPA were predicted as follows:

- Following the lower end of the SNCB's Approach the PVA indicated a potential 0.6% (at the 25-year point) and 0.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.994 and 0.992, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001); and
- Following the upper end of the SNCB's Approach the PVA indicated a potential 1.1% (at the 25-year point) and 1.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.989 and 0.985, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).

Table 55. Project alone PVA scenarios and results for Troup, Pennan and Lion's Head SPA guillemot feature.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Alone (Lower)	0.00020	1.000 (<0.001)	0.994 (0.010)	1.000 (<0.001)	0.992 (0.011)
	SNCB	Alone (Upper)	0.00037	1.000 (<0.001)	0.989 (0.010)	1.000 (<0.001)	0.985 (0.011)

The average annual colony count growth rates for guillemot feature of Troup, Pennan and Lion's Head SPA are presented in **Table 56.** Over the 30-year period presented, the guillemot population has grown at a rate of 1.61% per annum. When considering the population growth from 2007 to 2017, the annual compound growth rate increased to 3.84%, despite multiple OWFs being operational within the North Sea during that period. During the early 2000s a notable reduction in colony breeding success occurred across North Sea Scottish Colonies, which was suggested to have been caused by food shortages, particularly to species and colonies primarily reliant upon sandeels (Wanless et al. 2005). This correlates with the

reduction in the annual colony growth rate between 1995 – 2017 (**Table 56**). As shown in the annual compound growth rate between 2007 – 2017, following the food shortages in the early 2000s, the colony's growth rate has quickly recovered. This highlights the resilience of the Troup, Pennan and Lion's Head SPA colony to changing external environmental factors.

Table 56. Average annual colony growth rate for guillemot colony for Troup, Pennan and Lion's Head SPA between 1986 and 2017.

Species	Colony Annual Compound Growth Rate			
	1986-2017	1995-2017	2007-2017	2015-2017
Guillemot	1.61%	-2.45%	3.84%	7.65%

When considering the Project alone displacement impact on the guillemot population at the Troup, Pennan and Lion's Head SPA, there is a variability (as shown by the SD) in the counterfactual population size metric and a lack of variability in the counterfactual growth rate. Therefore, it is not expected that either scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot features of Troup, Pennan and Lion's Head SPA** in relation to displacement effects in the operation and maintenance phase form the Project alone. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

6.3.3.1.2 Razorbill

The potential for impacts resulting from displacement from the Project alone has been assessed against the latest 2017 colony count population size of 6,054 breeding adults (JNCC, 2022). Two annual impact scenarios, an upper and lower, were assessed for project alone following the SNCB's Approach. Therefore, the impact values assessed were of 0.7 and 1.2 adult mortalities per annum, respectively, within the PVA modelling.

The resulting PVA outputs (**Table 57**) for project alone impacts on the razorbill feature of Troup, Pennan and Lion's Head SPA were predicted as follows:

- Following the lower end of the SNCB's Approach the PVA indicated a potential 0.3% (at the 25-year point) and 0.4% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.997 and 0.996, respectively. For both 25-year and 35year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001); and
- Following the upper end of the SNCB's Approach the indicated a potential 0.6% (at the 25-year point) and 0.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.994 and 0.992, respectively. For the 25-year time period the counterfactual growth rate was 0.999 (SD <0.001) and for the 35-year time period the counterfactual growth rate was 1.000 (SD <0.001).

Table 57. Project alone PVA scenarios and results for Troup, Pennan and Lion's Head SPA

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Razorbill	SNCB	Alone (Lower)	0.00012	0.999 (0.001)	0.997 (0.039)	1.000 (<0.001)	0.996 (0.048)
	SNCB	Alone (Upper)	0.00020	0.999 (0.001)	0.994 (0.040)	1.000 (<0.001)	0.992 (0.048)

Over the 30-year period as presented in **Table 58**, the razorbill population has grown annually by 3.43% per annum at the Troup, Pennan and Lion's Head SPA. The current colony growth rates would suggest that the colony is growing strongly in recent years, with the latest numbers being 1,254 breeding adults above those from the 1997 citation. With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely.

Table 58. Average annual colony growth rate for razorbill colony for Troup, Pennan and Lion's Head SPA between 1986 and 2017.

Species	Colony Annual Compound Growth Rate (%)			
	1987-2017	1995-2017	2007-2017	2015-2017
Razorbill	3.43	-1.32	0.60	13.42

When considering the displacement impacts from the Project alone on the razorbill feature of the Troup, Pennen and Lion's Head SPA, accounting for the variability (as shown by the SD) in the counterfactual population size and a lack of variability in the counterfactual growth rate. It is not expected that either scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of Buchan Ness to Collieston Coast SPA** in relation to displacement effects in the operation and maintenance phase from the Project alone. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

6.3.3.2 In-combination

6.3.3.2.1 Guillemot

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 31,893 breeding adults (JNCC, 2022). Six impact scenarios with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling;

- SNCB's Approach including Berwick Bank impacts.
  - Lower mortality rate of 28.60 additional adult mortalities per annum.
  - Upper mortality rate of 59.30 additional adult mortalities per annum.
- Applicant's Approach including Berwick Bank impacts.
  - Mortality rate of 12.80 additional adult mortalities per annum.
- SNCB's Approach without Berwick Bank impacts.
  - Lower mortality rate of 23.40 additional adult mortalities per annum.
  - Upper mortality rate of 48.20 additional adult mortalities per annum.
- Applicant's Approach without Berwick Bank impacts.
  - Mortality rate of 10.40 additional adult mortalities per annum.

The resulting PVA outputs (**Table 59**) for the guillemot feature of Troup, Pennan and Lion's Head SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
   a. PVA indicated a potential 2.6% (at the 25-year point) and 3.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with

a counterfactual population size of 0.974 and0.964, respectively. For both 25-year and 35-year time periods the counterfactual growth rate was 0.999.

b. PVA indicated a potential 5.4% (at the 25-year point) and 7.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.946 and 0.925, respectively. For both 25-year and 35-year time periods the counterfactual growth rate was 0.998.

2. Applicant's Approach including Berwick Bank.
   a. PVA indicated a potential 1.2% (at the 25-year point) and 1.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.988 and 0.984, respectively. For both 25-year and 35-yeartime periods, the counterfactual growth rate was 1.000.
3. SNCB's Approach without Berwick Bank.
   a. PVA indicated a potential 2.1% (at the 25-year point) and 2.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.979 and 0.971, respectively for both 25-year and 35-year time periods, the counterfactual growth rate was 0.999.
   b. PVA indicated a potential 4.3% (at the 25-year point) and 5.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.957 and 0.941, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate was 0.998.
4. Applicant's Approach without Berwick Bank.
   a. PVA indicated a potential 1.0% (at the 25-year point) and 1.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.990 and 0.987, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate was 1.000.

Table 59. PVA results using Seabird PVA Tool for impacts apportioned to the Troup, Pennan and Lion's Head SPA guillemot population showing both displacement and combined in-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Displacement inc. Berwick Bank (Lower)	0.00090	0.999 (<0.001)	0.974 (0.010)	0.999 (<0.001)	0.964 (0.011)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00186	0.998 (<0.001)	0.946 (0.010)	0.998 (<0.001)	0.925 (0.010)
	Appl.	Displacement inc. Berwick Bank	0.00040	1.000 (<0.001)	0.988 (0.010)	1.000 (<0.001)	0.984 (0.011)
	SNCB	Displacement w/o Berwick Bank (Lower)	0.00073	0.999 (<0.001)	0.979 (0.010)	0.999 (<0.001)	0.971 (0.011)
	SNCB	Displacement w/o Berwick Bank (Upper)	0.00151	0.998 (<0.001)	0.957 (0.010)	0.998 (<0.001)	0.941 (0.010)
	Appl.	Displacement w/o Berwick Bank)	0.00033	1.000 (<0.001)	0.990 (0.010)	1.000 (<0.001)	0.987 (0.011)

Following analysis of the range of outputs from the in-combination PVAs for the guillemot feature of the Troup, Pennan and Lion's Head they are largely indicative of minimal reductions (**Table 59**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 7.5% reduction in population size after 35 years, with a decrease in growth rate of just 0.2%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish Waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 1.6% reduction in population size after 35 years.

Colony-specific population growth trends for guillemot show a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005) (**Table 56**). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.007% (2.3 birds) (**Table 35**) of the Troup, Pennan and Lion's Head SPA population of 31,893.This indicates that the effect of the

Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to the population reduction predicted, with or without Berwick Bank.

When considering the displacement impacts from the Project in-combination with other plans and projects on the guillemot feature of the Troup, Pennan and Lion's Head SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of Troup, Pennan and Lion's Head SPA** in relation to displacement effects in the operation and maintenance phase from the Project in- combination and, therefore, subject to natural change guillemot with be maintained as a feature in the long term.

6.3.3.2.2 Razorbill

The potential for impacts resulting from displacement for the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 6,054 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the Project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling:

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 6.70 additional adult mortalities per annum.
    b. Upper mortality rate of 16.90 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    - Mortality rate of 4.20 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 5.30 additional adult mortalities per annum.
    b. Upper mortality rate of 13.60 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    - Mortality rate of 3.50 additional adult mortalities per annum.

The resulting PVA outputs (**Table 60**) for the razorbill feature of Troup, Pennan and Lion's Head SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 3.3% (at the 25-year point) and 4.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.967 and 0.955, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.999.
    b. PVA indicated a potential 8.2% (at 25-year point) and 11.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.918 and 0.889, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.997.
2. Applicant's Approach including Berwick Bank.
    - PVA indicated a potential 2.1% (at 25-year point) and 2.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.979 and 0.971, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.999.
3. SNCB's Approach without Berwick Bank.
    a. PVA indicated a potential 2.7% (at 25-year point) and 3.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.973 and 0.964, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.999.

b. PVA indicated a potential 6.6% (at 25-year point) and 9.1% (at 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.934 and 0.909, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.997.

4. Applicant's Approach without Berwick Bank.
   - PVA indicated a potential 1.8% (at 25-year point) and 2.4% (at 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.982 and 0.976, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.999.

Table 60. PVA results using Seabird PVA Tool for impacts apportioned to the Troup, Pennan and Lion's Head SPA razerbill population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Razorbill	SNCB	Displacement inc. Berwick Bank (Lower)	0.00111	0.999 (0.001)	0.967 (0.039)	0.999 (0.001)	0.955 (0.046)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00279	0.997 (0.001)	0.918 (0.038)	0.997 (0.001)	0.889 (0.044)
	Appl.	Displacement inc. Berwick Bank	0.00069	0.999 (0.001)	0.979 (0.038)	0.999 (0.001)	0.971 (0.047)
	SNCB	Displacement excl. Berwick Bank (Lower)	0.00088	0.999 (0.001)	0.973 (0.039)	0.999 (0.001)	0.964 (0.047)
	SNCB	Displacement excl. Berwick Bank (Upper)	0.00225	0.997 (0.001)	0.934 (0.038)	0.997 (0.001)	0.909 (0.045)
	Appl.	Displacement excl. Berwick Bank	0.00058	0.999 (0.001)	0.982 (0.040)	0.999 (0.001)	0.976 (0.048)

Following analysis of the range of outputs from the in-combination PVAs for razorbill feature of the Troup, Pennan and Lion's Head SPA they are largely indicative of minimal reductions (**Table 60**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 11.1% reduction in population size after 35 years, with decrease in growth rate of just 0.3%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB's Approach

(MacArthur Green,2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 2.9% reduction in population size after 35 years.

Colony population growth trends over the long-term (**Table 60)** indicate the razorbill population has grown annually by 3.43% per annum at the Troup, Pennan and Lion's Head SPA. The current colony growth rates would suggest that the colony is growing strongly in recent years, with the latest numbers being 1,254 breeding adults above those from the 1997 citation. The colony specific population growth trends for razorbill shows a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005) (**Table 61**). With the projected growth rate not expected to vary significantly from that of the baseline population in all PVA modelling scenarios, the model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.003% (0.2 birds) (**Table 35**) of the Troup, Pennan and Lion's Head SPA population of 6,054. This indicates that the effect of the Project within the overall in-combination assessment of all other projects unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

Table 61. Annual colony compound growth rate for razorbill feature of the Troup, Pennan and Lion's Head SPA between 1986 – 2017

Species	Colony Annual Compound Growth Rate (%)			
	1987 - 2017	1995 - 2017	2007 - 2017	2015-2017
Razorbill	3.43	-1.32	0.60	13.42

When considering the displacement impacts from the Project in-combination with other plans and projects on the razorbill feature of the Troup, Pennan and Lion's Head SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the razorbill feature of Troup, Pennan and Lion's Head SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.3.2.3 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 21,232 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 76.38 adult mortalities per annum.
    b. Upper mortality rate of 103.74 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 72.68 adult mortalities per annum.
    b. Upper mortality rate of 99.94 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 62.68 additional adult mortalities per annum.
    b. Upper mortality rate of 85.34 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 70.48 adult mortalities per annum.
    b. Upper mortality rate of 93.44 additional adult mortalities per annum.

The PVA outputs (Table 62) for the kittiwake feature of Buchan Ness to Collieston Coast SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 10.5% (at the 25-year point) and 14.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.895 and 0.858, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 14% (at the 25-year point) and 18.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.860 and 0.811, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.994.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 10% (at the 25-year point) and 13.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.900 and 0.865, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 13.5% (at the 25-year point) and 18.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.865 and 0.818, respectively. For

both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.994.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 8.6% (at the 25-year point) and 11.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.914 and 0.883, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.997.
    b. PVA indicated a potential 11.6% (at the 25-year point) and 15.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.884 and 0.843, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 9.7% (at the 25-year point) and 13.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.903 and 0.868, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 12.7% (at the 25-year point) and 17.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.873 and 0.828, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.

Table 62. PVA results using Seabird PVA Tool for impacts apportioned to the Troup, Pennan and Lion's Head SPA kittiwake population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.00360	0.996 (0.000)	0.895 (0.009)	0.996 (0.000)	0.858 (0.009)
	SNCB	Combination inc. Berwick Bank (Upper)	0.00489	0.994 (0.000)	0.860 (0.009)	0.994 (0.000)	0.811 (0.009)
	Appl.	Combination inc. Berwick Bank (Lower)	0.00342	0.996 (0.000)	0.900 (0.010)	0.996 (0.000)	0.865 (0.009)
	Appl.	Combination inc. Berwick Bank (Upper)	0.00471	0.994 (0.000)	0.865 (0.009)	0.994 (0.000)	0.818 (0.009)
	SNCB	Combination w/o Berwick Bank (Lower)	0.00293	0.997 (0.000)	0.914 (0.010)	0.997 (0.000)	0.883 (0.010)
	SNCB	Combination w/o Berwick Bank (Upper)	0.00402	0.995 (0.000)	0.884 (0.009)	0.995 (0.000)	0.843 (0.009)
	Appl.	Combination w/o Berwick Bank (Lower)	0.00332	0.996 (0.000)	0.903 (0.010)	0.996 (0.000)	0.868 (0.010)
	Appl.	Combination w/o Berwick Bank (Upper)	0.00440	0.995 (0.000)	0.873 (0.010)	0.995 (0.000)	0.828 (0.009)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the Troup, Pennan and Lion's Head SPA they are potentially indicative of moderate reductions (**Table 62**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 18.9% reduction in population size after 35 years, with decrease in growth rate of just 0.6%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 18.2% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show a previously larger population but with significantly improved growth rates over the last few years (9.3% per annum 2017-

2021), likely associated with prey resources (Wanless *et al*., 2005). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 63. Annual colony compound growth rate for kittiwake feature of the Troup, Pennan and Lion's Head SPA between 1986 – 2017

Species	Colony Annual Compound Growth Rate (%)			
	1986 - 2021	1995-2021	2007 - 2021	2017-2021
Kittiwake	-0.58%	-2.98%	-2.75%	9.30%

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.004% (0.8 birds) (**Table 35**) of the Troup, Pennan and Lion's Head SPA population of 21,232 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the variability in growth trends (-2.98% - 9.3%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the Troup, Pennan and Lion's Head SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of Troup, Pennan and Lion's Head SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.4 East Caithness Cliffs SPA

6.3.4.1 Project Alone

6.3.4.1.1 Guillemot

The potential for impacts resulting from displacement from the Project alone has been assessed against the latest 2015 SMP colony count population size of 199,992 breeding adults (JNCC, 2022). Two annual impact scenarios, an upper and lower, were assessed for the project alone following the SNCB's Approach. Therefore, the impact values assessed were of 29 and 60 adult mortalities per annum, respectively, within the PVA modelling.

The resulting PVA outputs (**Table 64**) for project alone impacts on the guillemot feature of East Caithness Cliffs SPA were predicted as follows:

- Following the lower end of the SNCB's Approach the PVA indicated a potential 0.4% (at the 25-year point) and 0.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.996 and 0.994, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).
- Following the upper end of the SNCB's Approach the PVA indicated a potential 0.9% (at the 25-year point) and 1.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.991 and 0.988, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).

Table 64. PVA results using Seabird PVA Tool for impacts apportioned to the guillemot feature of East Caithness Cliffs SPA from the Project alone.

Species	Source	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Alone (Lower)	0.00015	1.000 (0.000)	0.996 (0.004)	1.000 (0.000)	0.994 (0.004)
	SNCB	Alone (Upper)	0.00030	1.000 (0.000)	0.991 (0.004)	1.000 (0.000)	0.988 (0.004)

The average annual colony count growth rates for the guillemot feature of East Caithness Cliffs SPA are presented in **Table 65**. Over the 30-year period presented, the guillemot population has grown at a rate of 1.12% per annum, despite multiple OWFs being operational within the North Sea during that period. When considering the population growth from 1999 to 2015, the annual compound growth rate decreased by 0.38%. During the early 2000s a notable reduction in colony breeding success occurred across North Sea Scottish Colonies,

which was suggested to have been caused by food shortages, particularly to species and colonies primarily reliant upon sandeels (Wanless et al. 2005). This correlates with the reduction in the annual colony growth rate between 1999 – 2015 (Swann, 2016) (**Table 65**). Unfortunately, no data were available to derive a more recent colony growth rate for assessment over the last 10 years for this colony. As it is not possible to know the guillemot growth rate over the next 35 years for the proposed lifespan of the Project, the current colony growth rates would suggest that the colony is reducing. However, the latest numbers are still well above those from 1986 citation (an increase of over 50,000 breeding adults).

Table 65. Average annual colony growth rate for guillemot colony for East Caithness Cliffs SPA between 1986 and 2015.

Species	Colony Annual Compound Growth Rate (%)	
	1986-2015	1999-2015
Guillemot	1.16	-0.40

When considering the project alone displacement impact on the guillemot population at the East Caithness Cliffs SPA under either scenario, there is small variability (as shown by the SD) in the counterfactual population size metric and a lack of variability in the counterfactual growth rate. Therefore, it is not expected that either scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature East Caithness Cliffs SPA** in relation to displacement effects in the operation and maintenance phase from the Project alone. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

6.3.4.2 In-combination

6.3.4.2.1 Guillemot

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2015 SMP colony count population size of 199,992 breeding adults (JNCC, 2022). Guillemot was not assessed for East Caithness Cliffs SPA in the Berwick Bank RIAA therefore two impact scenarios with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling;

1. SNCB's Approach.
    a. Lower mortality rate of 647.5 additional adult mortalities per annum.
    b. Upper mortality rate of 1,128.7 additional adult mortalities per annum.
2. Applicant's Approach.
    - Mortality rate of 202.2 additional adult mortalities per annum.

The resulting PVA outputs (**Table 66**) for the guillemot feature of the East Caithness Cliffs SPA were predicting the following:

1. SNCB's Approach.
    a. PVA indicated a potential 9.0% (at the 25-year point) and 12.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.910 and 0.877, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate was 0.996.
    b. PVA indicated a potential 15.2% (at the 25-year point) and 20.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.848 and 0.795, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate was 0.994.
2. Applicant's Approach.
    - PVA indicated a potential 2.9% (at the 25-year point) and 4.0% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.971 and 0.960, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate was 0.999.

Table 66. PVA results using Seabird PVA Tool for impacts apportioned to the guillemot feature of East Caithness Cliffs SPA in-combination with other projects.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	In-combination (Lower)	0.00324	0.996 (<0.001)	0.910 (0.005)	0.996 (<0.001)	0.877 (0.005)
	SNCB	In-combination (Upper)	0.00564	0.994 (<0.001)	0.848 (0.006)	0.994 (<0.001)	0.795 (0.007)
	Appl.	In-combination	0.00101	0.999 (<0.001)	0.971 (0.004)	0.999 (<0.001)	0.960 (0.004)

Following analysis of the range of outputs from the in-combination PVAs for the guillemot feature of the East Caithness Cliffs SPA they are largely indicative of minimal reductions (**Table 66**). The maximum predicted impact is with the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 20.5% reduction in population size after 35 years, with a decrease in growth rate of just 0.6%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish water predicts a potential 4.0% reduction in population size after 35 years.

Colony-specific population growth trends for guillemot show a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005) (**Table 65**). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.006% (13 birds) (**Table 35**) of the East Caithness Cliffs SPA population of 199,992. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

When considering the displacement impacts from the Project in-combination with other plans and projects on the guillemot feature of the East Caithness Cliffs SPA, the variability, long term colony growth, and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of East Caithness Cliffs SPA** in relation to displacement effects in the operation and

maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.4.2.2 Razorbill

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2015 SMP colony count population size of 40,256 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling;

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 115.5 additional adult mortalities per annum.
    b. Upper mortality rate of232.6 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Mortality rate of 48.5 additional adult mortalities per annum.
3. SNCB's Approach excluding Berwick Bank impacts.
    a. Lower mortality rate of 110.2 additional adult mortalities per annum.
    b. Upper mortality rate of 217.8 additional adult mortalities per annum.
4. Applicant' Approach excluding Berwick Bank impacts.
    a. Mortality rate of 44.8 additional adult mortalities per annum.

The resulting PVA outputs for the razorbill feature of the East Caithness Cliffs SPA (**Table 67**) were predicting the following:

1. SNCB's Approach including Berwick Bank.
    a. PVA indicated a potential 8.4% (at the 25-year point) and 11.5% (at the 35-year point) reduction in population size, with a counterfactual population size of 0.916 and 0.885, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.997.
    b. PVA indicated a potential 16.3% (at the 25-year point) and 21.8% (at the 35-year point) reduction in population size, with a counterfactual population of 0.837 and of 0.782, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.993.
2. Applicant's Approach including Berwick Bank.
    a. PVA indicated a potential 3.6% (at the 25-year point) and 5.0% (at the 35-year point) reduction in population size, with a counterfactual population of 0.964 and of 0.950, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.997.
3. SNCB's Approach without Berwick Bank.
    a. PVA indicated a potential 8.0% (at 25-year point) and 11.0% (at 35-year point) reduction in population size, with a counterfactual population of 0.920 and of 0.890, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.997.
    b. PVA indicated a potential 15.3% (at 25-year point) and 20.6% (at 35-year point) reduction in population size, with a counterfactual population of 0.847 and of 0.794,

respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.994.

4. Applicant's Approach without Berwick Bank.
   a. PVA indicated a potential 3.3% (at 25-year point) and 4.6% (35-year point) reduction in population size of 0.967 and of 0.954, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.999.

Table 67. PVA results using Seabird PVA Tool for impacts apportioned to the razorbill feature of East Caithness Cliffs SPA in-combination with other projects.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Razorbill	SNCB	Displacement inc. Berwick Bank (Lower)	0.00287	0.997 (<0.001)	0.916 (0.015)	0.997 (<0.001)	0.885 (0.017)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00578	0.993 (<0.001)	0.837 (0.014)	0.993 (<0.001)	0.782 (0.015)
	Appl.	Displacement inc. Berwick Bank	0.00121	0.999 (<0.001)	0.964 (0.015)	0.999 (<0.001)	0.950 (0.018)
	SNCB	Displacement excl. Berwick Bank (Lower)	0.00274	0.997 (<0.001)	0.920 (0.015)	0.997 (<0.001)	0.890 (0.017)
	SNCB	Displacement excl. Berwick Bank (Upper)	0.00541	0.994 (<0.001)	0.847 (0.014)	0.994 (<0.001)	0.794 (0.016)
	Appl.	Displacement excl. Berwick Bank	0.00111	0.999 (<0.001)	0.967 (0.015)	0.999 (<0.001)	0.954 (0.018)

Following analysis of the range of outputs from the in-combination PVAs for the razorbill feature East Caithness Cliffs SPA they are largely indicative of moderate reductions. The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 21.8% reduction in population size after 35 years, with a decrease in growth rate of 0.7%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from the operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023 and APEM 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 3.6% reduction in population size after 35 years. Furthermore, the contribution from the Project of only 2.5 to 4.2 birds using the SNCB's Approach and 0.7 birds using the Applicant's approach, the more realist scenario, to the in-combination impact should be considered.

Colony population growth trends over the long-term **Table 68**, indicate the razorbill population has grown annually by 2.25% per annum at the East Caithness Cliffs SPA. The current colony growth rates would suggest that the colony has continued growing steadily in recent years, with the latest numbers being 24,456 breeding adults above those from the 1996 citation. This is supported by national population trends reaching a peak in 2017 but showing a slowing in population growth in 2019 at Scottish sites as reported in the SMP report (2021). With the projected growth rate not expected to vary significantly from that of the baseline population with the Applicant's Approach, the model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.002% (0.7 birds) (**Table 35**), using the Applicant's Approach, of the East Caithness Cliffs SPA population of 40,256. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

Table 68. Annual colony compound growth rate for razorbill feature of the East Caithness Cliffs SPA between 1986 – 2015

Species	Colony Annual Compound Growth Rate (%)	
	1986 - 2015	1999 - 2015
Razorbill	2.25%	3.35%

When considering the displacement impacts from the Project in-combination with other plans and projects on the razorbill feature of the East Caithness Cliffs SPA, the variability, long-term colony growth and the Project's minimal contribution, it is not expected that any realistic scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the razorbill feature of East Caithness Cliffs SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.4.2.3 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2016 SMP colony count population size of 48,920 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 249.30 adult mortalities per annum.
    b. Upper mortality rate of 412.71 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 286.70 adult mortalities per annum.
    b. Upper mortality rate of 404.91 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 263.60 additional adult mortalities per annum.
    b. Upper mortality rate of 371.61 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 281.50 adult mortalities per annum.
    b. Upper mortality rate of 389.31 additional adult mortalities per annum.

The PVA outputs (Table 69) for the kittiwake feature of East Caithness Cliffs SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 16.9% (at the 25-year point) and 22.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.831 and 0.774, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.992.
    b. PVA indicated a potential 22.8% (at the 25-year point) and 30.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.772 and 0.698, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.990.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 16.7% (at the 25-year point) and 22.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.833 and 0.777, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.
    b. PVA indicated a potential 22.6% (at the 25-year point) and 29.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.774 and 0.702, respectively. For

both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.990.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 15.3% (at the 25-year point) and 20.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.847 and 0.795, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.
    b. PVA indicated a potential 20.8% (at the 25-year point) and 17.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.792 and 0.723, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 14.4% (at the 25-year point) and 19.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.856 and 0.807, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.994.
    b. PVA indicated a potential 11.8% (at the 25-year point) and 18.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.782 and 0.712, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991.

Table 69. PVA results using Seabird PVA Tool for impacts apportioned to the East Caithness Cliffs SPA kittiwake population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Displacement inc. Berwick Bank (Lower)	0.00510	0.992 ((0.001)	0.831 (0.029)	0.993 (0.002)	0.774 (0.042)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00844	0.990 (0.001)	0.772 (0.027)	0.990 (0.002)	0.698 (0.038)
	Appl.	Displacement inc. Berwick Bank (Lower)	0.00586	0.993 (0.001)	0.833 (0.029)	0.993 (0.001)	0.777 (0.042)
	Appl.	Displacement inc. Berwick Bank (Upper)	0.00828	0.990 (0.001)	0.774 (0.027)	0.990 (0.001)	0.702 (0.039)
	SNCB	Displacement excl. Berwick Bank (Lower)	0.00539	0.993 (0.001)	0.847 (0.029)	0.993 (0.001)	0.795 (0.043)
	SNCB	Displacement excl. Berwick Bank (Upper)	0.00760	0.991 (0.001)	0.792 (0.028)	0.991 (0.001)	0.723 (0.040)
	Appl.	Displacement excl. Berwick Bank (Lower)	0.00575	0.994 (0.001)	0.856 (0.030)	0.994 (0.001)	0.807 (0.004)
	Appl.	Combination excl. Berwick Bank (Upper)	0.00796	0.991 (0.001)	0.782 (0.029)	0.991 (0.002)	0.712 (0.040)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the East Caithness Cliffs SPA they are potentially indicative of large reductions (**Table 69**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 30.2% reduction in population size after 35 years, with decrease in growth rate of 1%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). With the additional consideration of macro-avoidance evidence from recent research, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 29.8% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show a declining population, with sizes consistently from the mid-1980s, increasing in rate of decline in the last 20 years (**Table 70**). Its notable that East Caithness Cliffs do not have more recent colony counts, though given the similarity of trends in the 80s and 90s with other local colonies and known foraging area overlap with Troup, Pennan and Lion's Head SPA populations (Wakefield et al., 2017), population size could have similarly improved. With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 70. Annual colony compound growth rate for kittiwake feature of the East Caithness Cliffs SPA between 1986 – 2015

Species	Colony Annual Compound Growth Rate (%)	
	1986 – 2015	1999-2015
Kittiwake	-0.97	-3.10

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.002% (1 birds) (**Table 35**) of the East Caithness Cliffs SPA population of 48,920. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research, likely Project sourced impacts are minimal. Considering; 1) the overall growth trends (-0.97 - -3.10%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the East Caithness Cliffs SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of East Caithness Cliffs SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.5 Forth Islands SPA

6.3.5.1 In-combination

6.3.5.1.1 Puffin

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2018 SMP colony count population size of 10,229 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination additional adult mortality rates per annum were subsequently run through the PVA modelling;

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 159.81 additional adult mortalities per annum.
    b. Upper mortality rate of 266.30 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Mortality rate of 44.45 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 141.61 additional adult mortalities per annum.
    b. Upper mortality rate of 236.08 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Mortality rate of 39.35 additional adult mortalities per annum.

The resulting PVA outputs (**Table 71**) for the puffin feature of Forth Islands SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 39% (at the 25-year point) and 49.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.610 and 0.504, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.981.
    b. PVA indicated a potential 55.4% (at the 25-year point) and 67.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.446 and 0.327, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.969.
2. Applicant's Approach including Berwick Bank.
    - PVA indicated a potential 12.7% (at the 25-year point) and 17.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.873 and 0.829, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
3. SNCB's Approach without Berwick Bank.
    a. PVA indicated a potential 35.1% (at the 25-year point) and 45% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.649 and 0.550, respectively. For both

25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.984.

b. PVA indicated a potential 51% (at the 25-year point) and 72.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.490 and 0.372, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.973.

4. Applicant's Approach without Berwick Bank.
   - PVA indicated a potential 11.3% (at the 25-year point) and 15.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.887 and 0.847, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.

Table 71. PVA results using Seabird PVA Tool for impacts apportioned to the Forth Islands SPA puffin population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Puffin	SNCB	Displacement inc. Berwick Bank (Lower)	0.01562	0.981 (0.001)	0.610 (0.022)	0.981 (0.001)	0.504 0.023
	SNCB	Displacement inc. Berwick Bank (Upper)	0.02603	0.969 (0.001)	0.446 (0.018)	0.969 (0.001)	0.327 0.017
	Appl.	Displacement inc. Berwick Bank	0.00435	0.995 (0.001)	0.873 (0.028)	0.995 (0.001)	0.829 0.033
	SNCB	Displacement w/o Berwick Bank (Lower)	0.01384	0.984 (0.001)	0.649 (0.023)	0.984 (0.001)	0.550 0.024
	SNCB	Displacement w/o Berwick Bank (Upper)	0.02308	0.973 (0.001)	0.490 (0.019)	0.973 (0.001)	0.372 0.019
	Appl.	Displacement w/o Berwick Bank	0.00385	0.995 (0.001)	0.887 (0.028)	0.995 (0.001)	0.847 0.033

Following analysis of the range of outputs from the in-combination PVAs for the puffin feature of the Forth Islands SPA they are potentially indicative of large reductions (**Table 71**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 49.6% reduction in population size after 35 years, with decrease in growth rate of 3.1%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are

significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 17.1% reduction in population size after 35 years.

Colony-specific population growth trends for puffin show a high degree of variability, having grown compared to the mid-1980s but declining in recent years, likely associated with prey resources (**Table 72**) (Wanless *et al*., 2005). The Applicant Approach PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.002% (0.2 birds) (**Table 35**) of the Forth Islands SPA population of 10,229 breeding adults. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to the population reduction predicted, with or without Berwick Bank.

Table 72. Annual colony compound growth rate for puffin feature of the Forth Islands SPA between 1989 – 2017.

Species	Colony Annual Compound Growth Rate* (%)		
	1989 - 2017	2003 - 2017	2009 - 2017
Puffin	2.69	-3.99	-1.69

*Colony growth rates based on the largest colony in the SPA; the Isle of May colony.

When considering the displacement impacts from the Project in-combination with other plans and projects on the puffin feature of the Forth Islands SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the puffin feature of Forth Islands SPA** in relation to displacement effects in the operation and maintenance phase from the Project sourced in-combination and, therefore, subject to natural change puffin will be maintained as a feature in the long term.

6.3.5.1.2 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2014 SMP colony count population size of 7,702 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 68.21 adult mortalities per annum.
    b. Upper mortality rate of 90.03 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 58.11 adult mortalities per annum.
    b. Upper mortality rate of 79.93 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 32.11 additional adult mortalities per annum.
    b. Upper mortality rate of 46.83 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 54.51 adult mortalities per annum.
    b. Upper mortality rate of 69.23 additional adult mortalities per annum.

The PVA outputs (**Table 73**) for the kittiwake feature of Forth Islands SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 24.1% (at the 25-year point) and 31.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.759 and 0.683, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.989.
    b. PVA indicated a potential 31.1% (at the 25-year point) and 40.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.689 and 0.597, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.986.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 20.7% (at the 25-year point) and 27.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.793 and 0.725, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991.
    b. PVA indicated a potential 26.7% (at the 25-year point) and 34.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.733 and 0.651, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.988.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 12.2% (at the 25-year point) and 16.4% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.878 and 0.836, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
    b. PVA indicated a potential 18.2% (at the 25-year point) and 23% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.828 and 0.770, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 14.3% (at the 25-year point) and 19.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.857 and 0.808, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.994.
    b. PVA indicated a potential 14.3% (at the 25-year point) and 19.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.805 and 0.741, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.992.

Table 73. PVA results using Seabird PVA Tool for impacts apportioned to the Forth Islands SPA kittiwake population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.00886	0.989 (<0.001)	0.759 (0.012)	0.989 (<0.001)	0.683 0.011
	SNCB	Combination inc. Berwick Bank (Upper)	0.01169	0.986 (<0.001)	0.689 (0.011)	0.986 (<0.001)	0.597 0.010
	Appl.	Combination inc. Berwick Bank (Lower)	0.00754	0.991 (<0.001)	0.793 (0.012)	0.991 (<0.001)	0.725 0.011
	Appl.	Combination inc. Berwick Bank (Upper)	0.01038	0.988 (<0.001)	0.733 (0.011)	0.988 (<0.001)	0.651 0.010
	SNCB	Combination w/o Berwick Bank (Lower)	0.00708	0.995 (<0.001)	0.878 (0.013)	0.995 (<0.001)	0.836 0.013
	SNCB	Combination w/o Berwick Bank (Upper)	0.00899	0.993 (<0.001)	0.828 (0.013)	0.993 (<0.001)	0.770 0.012
	Appl.	Combination w/o Berwick Bank (Lower)	0.00417	0.994 (<0.001)	0.857 (0.013)	0.994 (<0.001)	0.808 0.012
	Appl.	Combination w/o Berwick Bank (Upper)	0.00608	0.992 (<0.001)	0.805 (0.012)	0.992 (<0.001)	0.741 0.011

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the Forth Islands SPA they are potentially indicative of large reductions (**Table 73**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 40.3% reduction in population size after 35 years, with decrease in growth rate of 1.4%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 34.9% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show an improving population, with a positive compound growth rate for the last 23 years. With the potential projected reduced

growth rate (1.4%) less than half of the compound growth rate of the last ten years (3.21%), it is not expected to have a significant effect. With little variation expected from that of the baseline population in all modelling scenarios, the PVA model outputs likely fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 74. Annual colony compound growth rate for kittiwake feature of the Forth Islands SPA between 1986 – 2021.

Species	Colony Annual Compound Growth Rate			
	1986 - 2021	1995 - 2021	2000-2021	2010 - 2021
Kittiwake	-0.01	-1.50	0.99	3.21

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.001% (0.1 birds) (**Table 35**) of the Forth Islands SPA population of 7,702 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving growth rates (-1.50% – 3.21%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the Forth Islands SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of Forth Islands SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.5.1.3 Gannet

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2014 SMP colony count population size of 150,518 breeding adults (JNCC, 2022).Four impact scenarios with an upper and lower range where appropriate, for the project in-combinations were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling.

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 835.87 additional adult mortalities per annum.
    b. Upper mortality rate of 1122.40 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 757.12 additional adult mortalities per annum.
    b. Upper mortality rate of 798.35 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 652.67 additional adult mortalities per annum.
    b. Upper mortality rate of 877.10 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 615.22 additional adult mortalities per annum.
    b. Upper mortality rate of 647.25 additional adult mortalities per annum.

The resulting PVA outputs (**Table 75**) for the gannet feature of Forth Islands SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 15.7% (at the 25-year point) and 21.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.843 and 0.788, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.993.
    b. PVA indicated a potential 20.5% (at the 25-year point) and 27.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.795 and 0.727, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.991.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 14.2% (at the 25-year point) and 19.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.858 and 0.809, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.994.
    b. PVA indicated a potential 15% (at the 25-year point) and 21.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.850 and 0.782, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.994.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 12.3% (at the 25-year point) and 16.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.877 and 0.833, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.995.
    b. PVA indicated a potential 16.2% (at the 25-year point) and 21.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.838 and 0.782, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.993.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 11.8% (at the 25-year point) and 16% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.882 and 0.840, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.995.
    b. PVA indicated a potential 12.3% (at the 25-year point) and 16.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.877 and 0.833, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.995.

Table 75. PVA results using Seabird PVA Tool for impacts apportioned to the Forth Islands SPA gannet population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Gannet	SNCB	Combination inc. Berwick Bank (Lower)	0.00555	0.993 (<0.001)	0.843 (0.005)	0.993 (<0.001)	0.788 0.006
	SNCB	Combination inc. Berwick Bank (Upper)	0.00746	0.991 (<0.001)	0.795 (0.005)	0.991 (<0.001)	0.727 0.005
	Appl.	Combination inc. Berwick Bank (Lower)	0.00503	0.994 (<0.001)	0.858 (0.005)	0.994 (<0.001)	0.809 0.006
	Appl.	Combination inc. Berwick Bank (Upper)	0.00530	0.994 (<0.001)	0.850 (0.005)	0.994 (<0.001)	0.782 0.006
	SNCB	Combination excl. Berwick Bank (Lower)	0.00434	0.995 (<0.001)	0.877 (0.006)	0.995 (<0.001)	0.833 0.006
	SNCB	Combination excl. Berwick Bank (Upper)	0.00583	0.993 (<0.001)	0.838 (0.005)	0.993 (<0.001)	0.782 0.006
	Appl.	Combination excl. Berwick Bank (Lower)	0.00409	0.995 (<0.001)	0.882 (0.005)	0.995 (<0.001)	0.840 0.006
	Appl.	Combination excl. Berwick Bank (Upper)	0.00430	0.995 (<0.001)	0.877 (0.005)	0.995 (<0.001)	0.833 0.822

Following analysis of the range of outputs from the in-combination PVAs for the gannet feature of the Forth Islands SPA they are potentially indicative of moderate reductions. The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 27.3% reduction in population size after 35 years, with decrease in growth rate of 0.9%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gannet are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 21.8% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for gannet show a stable population. With the potential projected reduced growth rate (0.6%) significantly lower than the known growth

rate, it is not expected to have a significant effect on current population trends. With little variation expected from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 76. Annual colony compound growth rate for gannet feature of the Forth Islands SPA between 1986 – 2014.

Species	Colony Annual Compound Growth Rate (%)			
	1985 – 2014	1999 – 2014	2004 - 2014	2009-2014
Gannet	4.40	3.36	4.59	4.34

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.004% (6 birds) (**Table 35**) of the Forth Islands SPA population of 150,518 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving compound growth rates (3.36 - 4.59), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the gannet feature of the Forth Islands SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the gannet feature of Forth Islands SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change gannet will be maintained as a feature in the long term.

6.3.6 Fowlsheugh SPA

6.3.6.1 In-combination

6.3.6.1.1 Guillemot

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2018 SMP colony count population size of 93,570 breeding adults (JNCC, 2022). Four impact scenarios with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach**.** These in-combination adult mortality rates per annum were subsequently run through the PVA modelling;

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 433.10 additional adult mortalities per annum.
    b. Upper mortality rate of 808.50 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Mortality rate of 156.50 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 173.20 additional adult mortalities per annum.
    b. Upper mortality rate of 335.20 additional adult mortalities per annum.
4. Applicant without Berwick Bank impacts.
    a. Mortality rate of 67.50 additional adult mortalities per annum.

The resulting PVA outputs (**Table 77**) for the guillemot feature of Fowlsheugh SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 12.6% (at the 25-year point) and 17.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.874 and 0.829, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
    b. PVA indicated a potential 22.5% (at the 25-year point) and 29.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.705 and 0.941, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.990.
2. Applicant's Approach including Berwick Bank.
    a. PVA indicated a potential 4.7% (at the 25-year point) and 6.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.873 and 0.935, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.998.
3. SNCB's Approach without Berwick Bank.
    a. PVA indicated a potential 5.2% (at the 25-year point) and 7.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.948 and 0.928, respectively. For both 25-year

and 35-year time periods the counterfactual growth rate did not decrease below 0.998.

b. PVA indicated a potential 9.9% (at the 25-year point) and 13.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.901 and 0.965, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.

4. Applicant's Approach without Berwick Bank.
   a. PVA indicated a potential 12.1% (at the 25-year point) and 12.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.949 and 0.971, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.999.

Table 77. PVA results using Seabird PVA Tool for impacts apportioned to the Fowlsheugh SPA guillemot population showing both displacement and combined in-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Displacement inc. Berwick Bank (Lower)	0.00463	0.995 (<0.001)	0.874 (0.004)	0.995 (<0.001)	0.829 (0.004)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00864	0.990 (<0.001)	0.777 (0.004)	0.990 (<0.001)	0.705 (0.004)
	Appl.	Displacement inc. Berwick Bank	0.00167	0.998 (<0.001)	0.953 (0.005)	0.998 (<0.001)	0.935 (0.005)
	SNCB	Displacement w/o Berwick Bank (Lower)	0.00185	0.998 (<0.001)	0.948 (0.005)	0.998 (<0.001)	0.928 (0.005)
	SNCB	Displacement w/o Berwick Bank (Upper)	0.00358	0.996 (<0.001)	0.901 (0.005)	0.996 (<0.001)	0.865 (0.005)
	Appl.	Displacement w/o Berwick Bank	0.00072	0.999 (<0.001)	0.979 (0.005)	0.999 (<0.001)	0.971 (0.005)

Following analysis of the range of outputs from the in-combination PVAs for the guillemot feature of the Fowlsheugh SPA they are largely indicative of moderate reductions (**Table 77**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 29.9% reduction in population size after 35 years, with a decrease in growth rate of just 1%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB approach (MacArthur Green,

2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 6.5% reduction in population size after 35 years.

Colony-specific population growth trends for guillemot show a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.003% (2.4 birds) (**Table 35**) of the Fowlsheugh SPA population of 93,570.This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

Table 78. Annual colony compound growth rate for guillemot feature of the Fowlsheugh SPA between 1986 – 2017.

Species	Colony Annual Compound Growth Rate (%)			
	1987 - 2018	1995 – 2018	2007-2018	2015-2018
Guillemot	0.50	-0.08	1.05	3.43

When considering the displacement impacts from the Project in-combination with other plans and projects on the guillemot feature of the Fowlsheugh SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of Fowlsheugh SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.6.1.2 Razorbill

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2018 SMP colony count population size of 18,844 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling;

- SNCB's Approach including Berwick Bank impacts.
  - Lower mortality rate of 57.30 additional adult mortalities per annum.
  - Upper mortality rate of 106.80 additional adult mortalities per annum.
- Applicant' Approach including Berwick Bank impacts.
  - Mortality rate of 20.70 additional adult mortalities per annum.
- SNCB's Approach without Berwick Bank impacts.

    - Lower mortality rate of 44.60 additional adult mortalities per annum.
    - Upper mortality rate 83.80 additional adult mortalities per annum.
- Applicant 'Approach without Berwick Bank impacts.
    - mortality rate of 16.50 additional adult mortalities per annum.

The resulting PVA outputs for the razorbill feature of Fowlsheugh SPA (**Table 79**) were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 8.9% (at the 25-year point) and 12.1% (at the 35-year point) reduction in population size relative to the unimpacted population size of 0.911 and 0.879, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 16% (at the 25-year point) and 21.5% (at the 35-year point) reduction in population size relative to the unimpacted population size of 0.840 and 0.785, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.
2. Applicant's Approach including Berwick Bank.
    - PVA indicated a potential 3.3% (at the 25-year point) and 4.6% (at the 35-year point) reduction in population size relative to the unimpacted population size of 0.967 and 0.954, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.999.
3. SNCB's Approach without Berwick Bank.
    a. PVA indicated a potential 7% (at the 25-year point) and 9,6% (at the 35-year point) reduction in population size relative to the unimpacted population size of 0.930 and 0.904, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.997.
    b. PVA indicated a potential 12.8% (at the 25-year point) and 17.3% (at the 35-year point) reduction in population size relative to the unimpacted population size of 0.872 and 0.827, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
4. Applicant's Approach without Berwick Bank.
    - PVA indicated a potential 2.7% (at the 25-year point) and 3.7% (at the 35 year point) reduction in population size relative to the unimpacted population size of 0.973 and 0.963, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.999.

Table 79. PVA results using Seabird PVA Tool for impacts apportioned to the Fowlsheugh SPA razorbill population showing both displacement and combined in-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)	Density independent counterfactual metric (35 years)

				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Razorbill	SNCB	Displacement inc. Berwick Bank (Lower)	0.00304	0.996 (0.001)	0.911 (0.021)	0.996 (0.001)	0.879 (0.024)
	SNCB	Displacement inc. Berwick Bank (Upper)	0.00567	0.993 (0.001)	0.840 (0.020)	0.993 (0.001)	0.785 (0.023)
	Appl.	Displacement inc. Berwick Bank	0.00110	0.999 (0.001)	0.967 (0.022)	0.999 (0.001)	0.954 (0.026)
	SNCB	Displacement excl. Berwick Bank (Lower)	0.00237	0.997 (0.001)	0.930 (0.021)	0.997 (0.001)	0.904 (0.025)
	SNCB	Displacement excl. Berwick Bank (Upper)	0.00445	0.995 (0.001)	0.872 (0.020)	0.995 (0.001)	0.827 (0.024)
	Appl.	Displacement excl. Berwick Bank	0.0088	0.999 (0.001)	0.973 (0.022)	0.999 (0.001)	0.963 (0.026)

Following analysis of the range of outputs from in-combination PVAs for razorbill feature of the Fowlsheugh SPA they are potentially indicative of moderate predicted reductions from in-combination impacts (**Table 79**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 21.5% reduction in population size after 35 years, with a decrease in growth rate of 0.7%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB Approach (MacArthur Green, 2023; APEM 2022 and 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's approach which relies on the latest evidence for displacement from Scottish waters and predicts a potential 4.6% reduction in population size after 35 years.

Colony population growth trends over the long-term (**Table 80**), indicate the razorbill population has grown annually by 3.07% per annum at the Fowlsheugh SPA. The current colony growth rates would suggest that the colony has continued growing steadily in recent years, with the latest numbers being 13,044 breeding adults above those from the 1992 citation. With the projected growth rate not expected to vary significantly from that of the baseline population with the Applicant's Approach, the model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent <0.001% (0.001 – 0.004 birds) (**Table 35**), regardless of the Approach used, of the Fowlsheugh SPA population of 18,844. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

Table 80. Annual colony compound growth rate for razorbill feature of the Fowlsheugh SPA between 1986 – 2018

Species	Colony Annual Compound Growth Rate (%)			
	1986 – 2018	1999 – 2018	2006 - 2018	2016-2018
Razorbill	3.07	3.28	8.78	25.79

When considering the displacement impacts from the Project in-combination with other plans and projects on the razorbill feature of the Fowlsheugh SPA, the variability, long-term colony growth and the Project's minimal contribution, it is not expected that any realistic scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the razorbill feature of Fowlsheugh SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.6.1.3 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 28,078 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 201.06 adult mortalities per annum.
    b. Upper mortality rate of 253.38 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 91.96 adult mortalities per annum.
    b. Upper mortality rate of 122.98 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 170.56 additional adult mortalities per annum.
    b. Upper mortality rate of 222.78 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 159.76 adult mortalities per annum.
    b. Upper mortality rate of 190.68 additional adult mortalities per annum.

The PVA outputs (**Table 81**) for the kittiwake feature of Fowlsheugh SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 19.9% (at the 25-year point) and 26.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.801 and 0.735, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991.
    b. PVA indicated a potential 24.3% (at the 25-year point) and 32% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.757 and 0.680, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.989.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 17.2% (at the 25-year point) and 23% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.828 and 0.770, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.
    b. PVA indicated a potential 21.7% (at the 25-year point) and 28.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.783 and 0.713, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 19.7% (at the 25-year point) and 13.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.903 and 0.869, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 12.7% (at the 25-year point) and 17.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.873 and 0.829, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 12.7% (at the 25-year point) and 17.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.912 and 0.880, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 11.6% (at the 25-year point) and 15.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.884 and 0.843, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.

Table 81. PVA results using Seabird PVA Tool for impacts apportioned to the Fowlsheugh SPA kittiwake population showing both displacement and combined in-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.00716	0.991 (<0.001)	0.801 (0.009)	0.991 (<0.001)	0.735 (0.008)
	SNCB	Combination inc. Berwick Bank (Upper)	0.00902	0.989 (<0.001)	0.757 (0.008)	0.989 (<0.001)	0.680 (0.008)
	Appl.	Combination inc. Berwick Bank (Lower)	0.00607	0.993 (<0.001)	0.828 (0.009)	0.993 (<0.001)	0.770 (0.009)
	Appl.	Combination inc. Berwick Bank (Upper)	0.00793	0.991 (<0.001)	0.783 (0.009)	0.991 (<0.001)	0.713 (0.008)
	SNCB	Combination w/o Berwick Bank (Lower)	0.00328	0.996 (<0.001)	0.903 (0.010)	0.996 (<0.001)	0.869 (0.010)

	SNCB	Combination w/o Berwick Bank (Upper)	0.00438	0.995 (<0.001)	0.873 (0.009)	0.995 (<0.001)	0.829 (0.009)
	Appl.	Combination w/o Berwick Bank (Lower)	0.00569	0.996 (<0.001)	0.912 (0.010)	0.996 (<0.001)	0.880 (0.10)
	Appl.	Combination w/o Berwick Bank (Upper)	0.00679	0.995 (<0.001)	0.884 (0.009)	0.995 (<0.001)	0.843 (0.009)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the Fowlsheugh SPA they are potentially indicative of large reductions (**Table** 81). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 32% reduction in population size after 35 years, with decrease in growth rate of 1.1%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 28.7% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show a variable but improving trend, with a positive compound growth rate for the last 17 years. With the potential projected reduced growth rate (1.1%) around a quarter of the compound growth rate of the last ten years (4.16%), it is not expected to have a significant effect. With little variation expected from that of the baseline population in all modelling scenarios, the PVA model outputs likely fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 82. Annual colony compound growth rate for kittiwake feature of the Fowlsheugh SPA between 1986 – 2022

Species	Colony Annual Compound Growth Rate (%)					
	1986 - 2022	1992 - 2022	1999 - 2022	2006 - 2022	2012 - 2022	2018 - 2022
Kittiwake	-0.61	-2.99	-0.26	1.46	4.16	5.95

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.002% (0.6 birds) (**Table 35**) of the Fowlsheugh SPA population of 45,222 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving compound growth rates (-2.99% – 5.95%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the Fowlsheugh SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of Fowlsheugh SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.7 Copinsay SPA

6.3.7.1 In-combination

6.3.7.1.1 Guillemot

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2015 SMP colony count population size of 24,728 breeding adults (JNCC, 2022). Using the Applicant's approach impacts did not reach the threshold for further assessment using PVA. A single impact scenario with an upper and lower range, for the project in-combination was estimated following the SNCB's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling:

1. SNCB's Approach.
    a. Lower mortality rate of 3.40 additional adult mortalities per annum.
    b. Upper mortality rate of 8.30 additional adult mortalities per annum.

The resulting PVA outputs (**Table 83**) for the guillemot feature of Copinsay SPA were predicting the following:

1. SNCB's Approach.
    a. PVA indicated a potential 0.4% (at the 25-year point) and 0.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.996 and 0.994, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000.
    b. PVA indicated a potential 1.0% (at the 25-year point) and 1.4% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.990 and 0.986, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 1.000.

Table 83. PVA results using Seabird PVA Tool for impacts apportioned to the Copinsay SPA showing displacement from the Project in-combination with other developments.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate ± SD	Median Pop. Size ± SD	Median Growth rate ± SD	Median Pop. Size ± SD
Guillemot	SNCB	Displacement (Lower)	0.00014	1.000 (<0.001)	0.996 (0.011)	1.000 (<0.001)	0.994 (0.012)
	SNCB	Displacement (Upper)	0.00034	1.000 (<0.001)	0.990 (0.011)	1.000 (<0.001)	0.986 (0.012)

Following analysis of the range of outputs from the in-combination PVAs for the guillemot feature of Copinsay SPA they are largely indicative of minimal reductions. The maximum predicted impact is the SNCB upper limit approach. This PVA predicts a potential 0.6% reduction in population size after 35 years, with a decrease in growth rate of <0.1% However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement risk is significantly lower than those advocated for use by the SNCB's approach (MacArthur Green, 2023 and APEM, 2022 & 2023). Additionally, as the 3.6 additional birds from the Project contribution to the in-combination impact, any potential impact is viewed as negligible from the Project and therefore there is no potential AEoSI for guillemot at Copinsay SPA.

Colony-specific population trends for guillemot shows a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.015% (3.6 birds) (**In-combination impacts** using SNCB's approach

Table 41) of the Copinsay SPA population of 24,728. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

Table 84. Annual colony compound growth rate for guillemot feature of the Copinsay SPA between 1986 – 2015.

Species	Colony Annual Compound Growth Rate (%)		
	1986 - 2015	1999 - 2015	2008 - 2015
Guillemot	-1.60	-0.07	4.37

When considering the displacement impacts from the Project in-combination with other plans and projects on the guillemot feature of the Copinsay SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of Copinsay SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.8 North Caithness Cliffs SPA

6.3.8.1 Alone

6.3.8.1.1 Guillemot

The potential for impacts resulting from displacement from the Project alone has been assessed against the latest 2018 SMP colony count population size of 52,076 breeding adults (JNCC, 2022). A single annual impact scenario, with an upper and lower range, was assessed for project alone impacts. Therefore, the impact values assesses were of 6.7 and 16.4 adult mortalities per annum, respectively, within the PVA modelling.

The resulting PVA outputs (**Table 85**) for project alone impacts on the guillemot feature of North Caithness Cliffs SPA were predicted as follows:

- Following the lower end of the SNCB's Approach the PVA indicated a potential 0.4% (at the 25-year point) and 0.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.996 and 0.995, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).
- Following the upper end of the SNCB's Approach the PVA indicated a potential 0.9% (at the 25-year point) and 1.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.991 and 0.988, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).

Table 85. PVA results using Seabird PVA Tool for impacts apportioned to the North Caithness Cliffs SPA guillemot population from the Project Alone.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Alone (Lower)	0.00013	1.000 (<0.001)	0.996 (0.006)	1.000 (<0.001)	0.995 (0.007)
	SNCB	Alone (Upper)	0.00031	1.000 (<0.001)	0.991 (0.006)	1.000 (<0.001)	0.988 (0.007)

The average annual colony count growth rates for the guillemot feature of North Caithness Cliffs SPA are presented in **Table 86.** Over the 30-year period presented, the guillemot population has grown at a rate of 3.34% per annum. When considering the population growth over the last 20 years, the annual compound growth rate increased to 0.38%, despite multiple OWFs being operational within the North Sea during that period. During the early 2000s a notable reduction in colony breeding success occurred across North Sea Scottish colonies,

which was suggested to have been caused by food shortages, particularly to species and colonies primarily reliant upon sandeels (Wanless *et al*., 2005). This correlates with the reduction in the annual colony growth rate between 2001 – 2017 (**Table 86**). As shown in the annual compound growth rate between 2015 – 2018, following the food shortages in the early 2000s, the colony's growth rate has quickly recovered. This highlights the resilience of the North Caithness Cliffs SPA colony to changing external environmental factors.

Table 86. Annual colony compound growth rate for guillemot feature of the North Caithness Cliffs SPA between 1986 – 2018.

Species	Colony Annual Compound Growth Rate (%)			
	1986 - 2018	1993 - 2018	1999 - 2018	2015 - 2018
Guillemot	3.34	4.30	0.38	23.19

When considering the Project alone displacement impact on the guillemot population at the North Caithness Cliffs SPA, there is a variability (as shown by the standard deviation) in the counterfactual population size metric and a lack of variability in the counterfactual growth rate. Therefore, it is not expected that either scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of North Caithness Cliffs SPA** in relation to displacement effects in the operation and maintenance phase from the Project alone. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

6.3.8.2 In-combination

6.3.8.2.1 Guillemot

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2018 SMP colony count population size of 52,076 breeding adults (JNCC, 2022). Two impact scenarios with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling:

1. SNCB's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 61.7 additional adult mortalities per annum.
    b. Upper mortality rate of 121.5 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Mortality rate of30.5 additional adult mortalities per annum.

The resulting PVA outputs (**Table 87**) for the guillemot feature of North Caithness Cliffs SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 3.3% (at the 25-year point) and 4.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.967 and 0.954, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).
    b. PVA indicated a potential 1.5% (at the 25-year point) and 9.0% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.985 and 0.910, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 6.6% (at the 25-year point) and 2.4% (at the 35-year point) reduction in population size in relation to the unimpacted population size, with a counterfactual population size of 0.934 and 0.976, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 1.000 (SD <0.001).

Table 87. PVA results using Seabird PVA Tool for impacts apportioned to the North Caithness Cliffs SPA guillemot population showing both displacement and combined in-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Guillemot	SNCB	Displacement (Lower)	0.00118	0.999 (<0.001)	0.967 (0.006)	0.999 (<0.001)	0.954 (0.007)
	SNCB	Displacement (Upper)	0.00233	0.997 (<0.001)	0.935 (0.006)	0.997 (<0.001)	0.910 (0.007)
	Appl.	Displacement (Lower)	0.00059	0.999 (<0.001)	0.984 (0.006)	0.999 (<0.001)	0.976 (0.007)

Following analysis of the range of outputs from the in-combination PVAs for the guillemot feature of the North Caithness Cliffs SPA they are largely indicative of minimal reductions (**Table 87**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 9% reduction in population size after 35 years, with negligible changes in growth rate. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that displacement rates for auks are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023 and APEM, 2022 & 2023). Therefore, the Applicant considers the more realistic scenario following the Applicant's Approach, which relies on the latest evidence for displacement from Scottish waters and predicts a potential 2.4% reduction in population size after 35 years.

Colony-specific population growth trends for guillemot show a high degree of variability, likely associated with prey resources (Wanless *et al*., 2005). With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the high level of natural variation of population growth, indicating little to no true impact is likely. Further, the contribution to the overall in-combination numbers from the Project alone represent 0.007% (4 birds) (**Table 35**) of the North Caithness Cliffs SPA population of 52,076. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is unlikely to be the primary contributor to any population reduction predicted, with or without Berwick Bank.

When considering the displacement impacts from the Project in-combination with other plans and projects on the guillemot feature of the North Caithness Cliffs SPA, the variability, long term colony growth and the Project's minimal contribution, it is not expected that any scenario would significantly affect the predicted population trend.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the guillemot feature of North Caithness Cliffs SPA** in relation to displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change guillemot will be maintained as a feature in the long term.

6.3.8.2.2 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2016 SMP colony count population size of 11,136 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 47.3 adult mortalities per annum.
    b. Upper mortality rate of 62.7 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 39.7 adult mortalities per annum.
    b. Upper mortality rate of 52.5 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 45.5 additional adult mortalities per annum.
    b. Upper mortality rate of 60.8 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 44.2 adult mortalities per annum.
    b. Upper mortality rate of 56.9 additional adult mortalities per annum.

The PVA outputs (**Table 88**) for the kittiwake feature of North Caithness Cliffs SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 12.4% (at the 25-year point) and 16.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.876 and 0.832, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
    b. PVA indicated a potential 15.8% (at the 25-year point) and 21.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.842 and 0.787, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 11.9% (at the 25-year point) and 16.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.881 and 0.839, respectively. For

both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.

b. PVA indicated a potential 15.6% (at the 25-year point) and 20.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.844 and 0.791, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.993.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 10.5% (at the 25-year point) and 14.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.895 and 0.857, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
    b. PVA indicated a potential 13.5% (at the 25-year point) and 18.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.865 and 0.819, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.994.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 11.6% (at the 25-year point) and 15.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.884 and 0.843, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.995.
    b. PVA indicated a potential 14.3% (at the 25-year point) and 19.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.857 and 0.808, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.994.

Table 88. PVA results using Seabird PVA Tool for impacts apportioned to the North Caithness Cliffs SPA kittiwake population showing both displacement and combined in-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.00425	0.995 (<0.001)	0.876 (0.021)	0.995 (<0.001)	0.832 (0.022)
	SNCB	Combination inc. Berwick Bank (Upper)	0.00563	0.993 (<0.001)	0.842 (0.021)	0.993 (<0.001)	0.787 (0.021)
	Appl.	Combination inc. Berwick Bank (Lower)	0.00409	0.995 (<0.001)	0.881 (0.021)	0.995 (<0.001)	0.839 (0.023)
	Appl.	Combination inc. Berwick Bank (Upper)	0.00546	0.993 (<0.001)	0.844 (0.021)	0.993 (<0.001)	0.791 (0.022)
	SNCB	Combination w/o Berwick Bank (Lower)	0.00357	0.996 (<0.001)	0.895 (0.021)	0.996 (<0.001)	0.857 (0.023)
	SNCB	Combination w/o Berwick Bank (Upper)	0.00472	0.994 (<0.001)	0.865 (0.021)	0.994 (<0.001)	0.819 (0.022)
	Appl.	Combination w/o Berwick Bank (Lower)	0.00400	0.995 (<0.001)	0.884 (0.021)	0.995 (<0.001)	0.843 (0.023)
	Appl.	Combination w/o Berwick Bank (Upper)	0.00500	0.994 (<0.001)	0.857 (0.020)	0.994 (<0.001)	0.808 (0.022)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the North Caithness Coast SPA they are potentially indicative of large reductions (**Table 88**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 21.3% reduction in population size after 35 years, with decrease in growth rate of 0.7%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 20.9% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show a variable but currently declining population**.** Its notable that North Caithness Cliffs do not have more recent colony counts,

though given the similarity of trends with other local colonies and known foraging area overlap with Troup, Pennan and Lion's Head SPA populations (Wakefield et al., 2017), population size could have similarly improved. With the projected growth rate not expected to vary significantly from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 89. Annual colony compound growth rate for kittiwake feature of the North Caithness Cliffs SPA between 1986 – 2016

Species	Colony Annual Compound Growth Rate (%)	
	1986 - 2016	1999 - 2016
Kittiwake	1.92	-1.72

The contribution to the overall in-combination numbers from the Project alone represent <0.001% (0.1 birds) (**Table 35**) of the North Caithness Cliffs SPA population of 15,064 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving compound growth rates (1.92% – -1.72%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the North Caithness Cliffs SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of North Caithness Cliffs SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.9 St Abb's Head to Fast Castle SPA

6.3.9.1 In-combination

6.3.9.1.1 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 9,200 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 334.11 additional adult mortalities per annum.
    b. Upper mortality rate of 402.73 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 21.41 adult mortalities per annum.
    b. Upper mortality rate of 31.23 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 246.41 additional adult mortalities per annum.
    b. Upper mortality rate of 314.93 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 21.30 adult mortalities per annum.
    b. Upper mortality rate of 31.03 additional adult mortalities per annum.

The PVA outputs (**Table 90**) for the kittiwake feature of St Abb's Head to Fast Castle SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 87.7% (at the 25-year point) and 79.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.323 and 0.209, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.957.
    b. PVA indicated a potential 75.1% (at the 25-year point) and 85.4% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.249 and 0.146, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.948.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 56.9% (at the 25-year point) and 68.9% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.431 and 0.311, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.968.

   b. PVA indicated a potential 65.6% (at the 25-year point) and 77.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.344 and 0.228, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.960.

3. SNCB's Approach without Berwick Bank impacts.
   a. PVA indicated a potential 6.8% (at the 25-year point) and 9.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.932 and 0.907, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.997.
   b. PVA indicated a potential 10% (at the 25-year point) and 13.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.900 and 0.865, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
4. Applicant's Approach without Berwick Bank impacts.
   a. PVA indicated a potential 10% (at the 25-year point) and 13.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.900 and 0.865, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.
   b. PVA indicated a potential 8.8% (at the 25-year point) and 12% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.912 and 0.880, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.996.

Table 90. PVA results using Seabird PVA Tool for impacts apportioned to the St Abb's Head to Fast Castle SPA kittiwake population showing both displacement and combined In-combination outputs, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.03632	0.957 (<0.001)	0.323 (0.008)	0.957 (<0.001)	0.209 (0.006)
	SNCB	Combination inc. Berwick Bank (Upper)	0.04378	0.948 (<0.001)	0.249 (0.007)	0.948 (<0.001)	0.146 (0.005)
	Appl.	Combination inc. Berwick Bank (Lower)	0.02678	0.968 (<0.001)	0.431 (0.010)	0.968 (<0.001)	0.311 (0.008)
	Appl.	Combination inc. Berwick Bank (Upper)	0.03423	0.960 (<0.001)	0.344 (0.009)	0.960 (<0.001)	0.228 (0.007)
	SNCB	Combination w/o Berwick Bank (Lower)	0.00233	0.997 (<0.001)	0.932 (0.019)	0.997 (<0.001)	0.907 (0.020)
	SNCB	Combination w/o Berwick Bank (Upper)	0.00339	0.996 (<0.001)	0.900 (0.018)	0.996 (<0.001)	0.865 (0.019)
	Appl.	Combination w/o Berwick Bank (Lower)	0.00200	0.998 (<0.001)	0.940 (0.019)	0.998 (<0.001)	0.918 (0.020)
	Appl.	Combination w/o Berwick Bank (Upper)	0.00300	0.996 (<0.001)	0.912 (0.019)	0.996 (<0.001)	0.880 (0.019)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the St Abb's Head to Fast Castle SPA they are potentially indicative of large reductions (**Table 90**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 85.4% reduction in population size after 35 years, with decrease in growth rate of 5.2%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 77.2% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake shows an improving trend, with the compound growth rate variable but overall increasing implying a growing colony. The potential projected reduced growth rate (4%) potential impact on these improvements. Without Berwick Bank however, these impacts are minimal at 0.4%, and would not be expected to have a significant effect. With little variation expected from that of the baseline population in all modelling scenarios, whether the in-combination PVA model outputs fall within the natural variation is heavily dependent on the inclusion of Berwick Bank.

Table 91. Annual colony compound growth rate for kittiwake feature of the St Abb's Head to Fast Castle SPA between 1986 – 2021.

Species	Colony Annual Compound Growth Rate (%)			
	1986 - 2021	1999 - 2021	2011 - 2021	2016-2021
Kittiwake	-3.12	-3.28	-0.19	-0.86

The contribution to the overall in-combination numbers from the Project alone represent <0.001% (0.13 birds) (**Table 35**) of the St Abb's Head to Fast Castle SPA population of 15,064 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving compound growth rates (-3.32% – -0.86%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the St Abb's Head to Fast Castle SPA it is not expected to significantly affect the predicted population trend, unless the Berwick Bank project is included in the assessment.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of St Abb's Head to Fast Castle Cliffs SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.10 West Westray SPA

6.3.10.1 In-combination

6.3.10.1.1 Kittiwake

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2017 SMP colony count population size of 5,510 breeding adults (JNCC, 2022). Four impact scenarios, with an upper and lower range where appropriate, for the project in-combination were estimated following the SNCB's Approach and Applicant's Approach. The following in-combination adult mortality rates per annum were subsequently run through the PVA modelling as effects on adult survival rates;

1. SNCB' Approach including Berwick Bank impacts.
    a. Lower mortality rate of 50.62 additional adult mortalities per annum.
    b. Upper mortality rate of 66.35 additional adult mortalities per annum.
2. Applicant's Approach including Berwick Bank impacts.
    a. Lower mortality rate of 41.72 adult mortalities per annum.
    b. Upper mortality rate of 54.35 additional adult mortalities per annum.
3. SNCB's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 48.42 additional adult mortalities per annum.
    b. Upper mortality rate of 64.15 additional adult mortalities per annum.
4. Applicant's Approach without Berwick Bank impacts.
    a. Lower mortality rate of 46.92 adult mortalities per annum.
    b. Upper mortality rate of 59.55 additional adult mortalities per annum.

The PVA outputs (**Table 92**) for the kittiwake feature of St Abb's Head to Fast Castle SPA predicted for the:

1. SNCB' Approach including Berwick Bank impacts.
    a. PVA indicated a potential 24.8% (at the 25-year point) and 32.6% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.752 and 0.674, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.989.
    b. PVA indicated a potential 31% (at the 25-year point) and 40.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.690 and 0.598, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.986.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 24.8% (at the 25-year point) and 31.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.762 and 0.687, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.990

   b. PVA indicated a potential 31% (at the 25-year point) and 40.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.690 and 0.597, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.986

3. SNCB's Approach without Berwick Bank impacts
   a. PVA indicated a potential 20.9% (at the 25-year point) and 27.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.791 and 0.723, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991
   b. PVA indicated a potential 31% (at the 25-year point) and 40.3% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.736 and 0.655, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.988.
4. Applicant's Approach without Berwick Bank impacts
   a. PVA indicated a potential 22% (at the 25-year point) and 29% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.780 and 0.710, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.991.
   b. PVA indicated a potential 26.6% (at the 25-year point) and 34.8% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.734 and 0.652, respectively. For both 25-year and 35-year time periods the counterfactual growth rate did not decrease below 0.988.

Table 92. PVA results using Seabird PVA Tool for impacts apportioned to the West Westray SPA showing both displacement and combined In-combination outputs for the kittiwake feature, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Kittiwake	SNCB	Combination inc. Berwick Bank (Lower)	0.00919	0.989 (0.001)	0.752 (0.027)	0.989 (0.001)	0.674 (0.027)
	SNCB	Combination inc. Berwick Bank (Upper)	0.01204	0.986 (0.001)	0.690 (0.025)	0.986 (0.001)	0.598 (0.024)
	Appl.	Combination inc. Berwick Bank (Lower)	0.00879	0.990 (0.001)	0.762 (0.027)	0.990 (0.001)	0.687 (0.027)
	Appl.	Combination inc. Berwick Bank (Upper)	0.01164	0.986 (0.001)	0.690 (0.025)	0.986 (0.001)	0.597 (0.024)
	SNCB	Combination w/o Berwick Bank (Lower)	0.00757	0.991 (0.001)	0.791 (0.028)	0.991 (0.001)	0.723 (0.028)
	SNCB	Combination w/o Berwick Bank (Upper)	0.00986	0.988 (0.001)	0.736 (0.026)	0.988 (0.001)	0.655 (0.026)
	Appl.	Combination w/o Berwick Bank (Lower)	0.00800	0.991 (0.001)	0.780 (0.027)	0.991 (0.001)	0.710 (0.027)
	Appl.	Combination w/o Berwick Bank (Upper)	0.01000	0.988 (0.001)	0.734 (0.026)	0.988 (0.001)	0.652 (0.026)

Following analysis of the range of outputs from the in-combination PVAs for the kittiwake feature of the West Westray SPA they are potentially indicative of large reductions (**Table 92**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 40.2% reduction in population size after 35 years, with decrease in growth rate of 1.4%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gulls are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 30.3% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for kittiwake show a variable but improving trend, with a compound growth rates improving significantly in the last 20 years (**Table 92**). With the potential projected reduced growth rate (1.4%) lower than the known growth variability, it is not expected to have a significant effect on current population trends. With little variation

expected from that of the baseline population in all modelling scenarios, the PVA model outputs likely fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 93. Annual colony compound growth rate for kittiwake feature of the West Westray SPA between 1986 – 2018.

Species	Colony Annual Compound Growth Rate (%)			
	1986 - 2018	1994 - 2018	1999 - 2018	2004 - 2018
Kittiwake	-7.51	-7.77	-11.24	-6.53

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.003% (0.15 birds) (**Table 35**) of the West Westray SPA population of 5,510 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving compound growth rates (-11.24 - -6.54%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the kittiwake feature of the West Westray SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the kittiwake feature of West Westray SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change kittiwake will be maintained as a feature in the long term.

6.3.11 Hermaness, Saxa Vord and Valla Field SPA

6.3.11.1 In-combination

6.3.11.1.1 Gannet

The potential for impacts resulting from displacement from the Project in-combination with other plans and projects has been assessed against the latest 2014 SMP colony count population size of 51,160 breeding adults (JNCC, 2022).Four impact scenarios with an upper and lower range where appropriate, for the project in-combinations were estimated following the SNCB's Approach and Applicant's Approach. These in-combination adult mortality rates per annum were subsequently run through the PVA modelling.

5. SNCB's Approach including Berwick Bank impacts.
    c. Lower mortality rate of 76.79 additional adult mortalities per annum.
    d. Upper mortality rate of 105.50 additional adult mortalities per annum.
6. Applicant's Approach including Berwick Bank impacts.
    c. Lower mortality rate of 74.09 additional adult mortalities per annum.
    d. Upper mortality rate of 74.40 additional adult mortalities per annum.
7. SNCB's Approach without Berwick Bank impacts.
    c. Lower mortality rate of 74.19 additional adult mortalities per annum.
    d. Upper mortality rate of 101.40 additional adult mortalities per annum.
8. Applicant's Approach without Berwick Bank impacts.
    c. Lower mortality rate of 72.19 additional adult mortalities per annum.
    d. Upper mortality rate of 76.20 additional adult mortalities per annum.

The resulting PVA outputs (**Table 94**) for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA were predicting the following:

1. SNCB's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 4.5% (at the 25-year point) and 6.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.955 and 0.938, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.
    b. PVA indicated a potential 6.2% (at the 25-year point) and 8.5% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.938 and 0.915, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.
2. Applicant's Approach including Berwick Bank impacts.
    a. PVA indicated a potential 4.5% (at the 25-year point) and 6.2% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.955 and 0.938, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.
    b. PVA indicated a potential 4.5% (at the 25-year point) and 6.1% (at the 35-year point) reduction in population size relative to the unimpacted population size,

with a counterfactual population size of 0.955 and 0.939, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.

3. SNCB's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 4.5% (at the 25-year point) and 6.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.955 and 0.939, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.
    b. PVA indicated a potential 5.9% (at the 25-year point) and 8.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.941 and 0.919, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.
4. Applicant's Approach without Berwick Bank impacts.
    a. PVA indicated a potential 4.1% (at the 25-year point) and 5.7% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.959 and 0.943, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.
    b. PVA indicated a potential 4.5% (at the 25-year point) and 6.1% (at the 35-year point) reduction in population size relative to the unimpacted population size, with a counterfactual population size of 0.955 and 0.939, respectively. For both 25-year and 35-year time periods, the counterfactual growth rate did not decrease below 0.998.

Table 94. PVA results using Seabird PVA Tool for impacts apportioned to the Hermaness, Saxa Vord and Valla field SPA showing both displacement and combined In-combination outputs for the gannet feature, with and without Berwick Bank.

Species	Approach	Scenario	Mortality rate relative to the population	Density independent counterfactual metric (25 years)		Density independent counterfactual metric (35 years)	
				Median Growth rate (SD)	Median Pop. Size (SD)	Median Growth rate (SD)	Median Pop. Size (SD)
Gannet	SNCB	Combination inc. Berwick Bank (Lower)	0.00150	0.998 (0.001)	0.955 (0.015)	0.998 (<0.001)	0.938 (0.016)
	SNCB	Combination inc. Berwick Bank (Upper)	0.00206	0.998 (0.001)	0.938 (0.015)	0.998 (<0.001)	0.915 (0.016)
	Appl.	Combination inc. Berwick Bank (Lower)	0.00145	0.998 (0.001)	0.955 (0.015)	0.998 (<0.001)	0.938 (0.016)
	Appl.	Combination inc. Berwick Bank (Upper)	0.00153	0.998 (0.001)	0.955 (0.015)	0.998 (<0.001)	0.939 (0.017)
	SNCB	Combination excl. Berwick Bank (Lower)	0.00145	0.998 (0.001)	0.955 (0.015)	0.998 (<0.001)	0.939 (0.016)
	SNCB	Combination excl. Berwick Bank (Upper)	0.00198	0.998 (0.001)	0.941 (0.014)	0.998 (<0.001)	0.919 (0.016)
	Appl.	Combination excl. Berwick Bank (Lower)	0.00141	0.998 (0.001)	0.959 (0.015)	0.998 (<0.001)	0.943 (0.016)
	Appl.	Combination excl. Berwick Bank (Upper)	0.00149	0.998 (0.001)	0.955 (0.015)	0.998 (<0.001)	0.939 (0.016)

Following analysis of the range of outputs from the in-combination PVAs for the gannet feature of the Hermaness, Saxa Vord and Valla Field SPA they are potentially indicative of minimal reductions (**Table 94**). The maximum predicted impact is when Berwick Bank is included in the in-combination assessments following the upper limits of the SNCB's Approach. This PVA predicts a potential 8.5% reduction in population size after 35 years, with decrease in growth rate of 0.2%. However, this uppermost prediction is viewed as highly precautionary, as recent evidence from operational OWFs in Scottish waters indicate that collision and displacement rates for gannet are significantly lower than those advocated for use in the SNCB's Approach (MacArthur Green, 2023). The Applicant considers the more realistic scenario as following the Applicant's Approach, which relies on the latest evidence for collision and displacement from Scottish waters and predicts a potential 6.1% reduction in population size after 35 years (if including Berwick Bank).

Colony-specific population growth trends for gannet show a stable population with a slight decline in recent years. With the potential projected reduced growth rate (0.2%) significantly lower than the known growth rate, it is not expected to have a significant effect on current population trends. With little variation expected from that of the baseline population in all modelling scenarios, the PVA model outputs fall within the natural variation of population growth, indicating little to no true impact is likely.

Table 95. Annual colony compound growth rate for gannet feature of the Hermaness, Saxa Vord and Valla Field SPA between 1986 – 2014.

Species	Colony Annual Compound Growth Rate (%)			
	1985 – 2014	1999 – 2014	2004 – 2014	2008-2014
Gannet	3.45	3.86	4.58	0.82

Further, the contribution to the overall in-combination numbers from the Project alone represent 0.002% (0.9 birds) (**Table 35**) of the Hermaness, Saxa Vord and Valla Field SPA population of 51,160 breeding adults. When considering the collision and displacement, along with the additional consideration of macro-avoidance evidence from recent research. This indicates that the effect of the Project within the overall in-combination assessment of all other projects is very minimal to the population reduction predicted, with or without Berwick Bank.

Considering; 1) the improving compound growth rates (-11.24 - -6.54%), 2) the minimal contribution from the Project to the in-combination impacts values, and 3) the lack of incorporation of macro-avoidance within the approaches, the Project in-combination with other plans and projects on the gannet feature of the Hermaness, Saxa Vord and Valla Field SPA it is not expected to significantly affect the predicted population trend in any scenario.

There is, therefore, **no potential for an AEoSI to the conservation objectives of the gannet feature of Hermaness, Saxa Vord and Valla Field SPA** in relation to collision and displacement effects in the operation and maintenance phase from the Project in-combination and, therefore, subject to natural change gannet will be maintained as a feature in the long term.

6.4 Conclusions and summary outputs

Further assessments were undertaken using PVA for sites and features identified in which the percentage point change in survival reached or exceeded 0.02 and the contribution from the Project was one mortality or more, with the exception for sites and features that were identified for Berwick Bank (project alone or in-combination) as having potential AEoSI as determined by NatureScot (2023d). Summary PVA outputs and impacts are presented for the Project alone impacts and in-combination impacts with other projects including Berwick Bank, which represents the maximum impact scenario. Ranges shown in each Table below for in-combination impacts represent the minimum and maximum values for all scenarios assessed; the Applicant's and SNCB's. For assessment of impacts in-combination excluding Berwick Bank see individual site assessments.

6.4.1 Determination of AEoSI for Project alone impacts

Sites and features assessed for impacts from the Project alone representing the 35-year PVA outputs are summarised in **Table 96**. The Project alone impacts represent the SNCB approach only as assessment using the Applicant's approach for all sites and features did not reach the threshold for further assessment by PVA. Using the Applicant's approach, it can therefore be **concluded that an AEoSI can be ruled out for all sites and features** in **Table 96**.

Table 96. Summary of assessed sites and features from the Project alone displacement impacts.

Site	Feature	Counterfactual Median Growth rate*	Counterfactual Median Population Size*	Additional annual mortality contributed by the Project**	Additional annual mortality as % of population	AEoSI
Buchan Ness to Collieston Coast SPA						
	Guillemot	1.000 - 0.999	0.986 - 0.975	5.1 – 28.2	0.01 – 0.06%	No
Troup, Pennan and Lion's Head SPA						
	Guillemot	1.000 – 1.000	0.992 - 0.985	2.3 – 11.8	0.007 – 0.03%	No
	Razorbill	1.000 – 1.000	0.992 - 0.996	0.2 – 1.2	0.003 – 0.01%	No
East Caithness SPA						
	Guillemot	1.000 – 1.000	0.994 - 0.988	13 - 60	0.006 – 0.03%	No
North Caithness SPA						
	Guillemot	1.000 – 1.000	0.995 - 0.988	4 – 16.4	0.007 – 0.03%	No

** Values given for the range of impacts representing SNCB scenarios, **range of mortalities represents all scenarios, Applicant's and SNCB's.*

Thresholds for undertaking PVA were reached for four sites and for only guillemot and razorbill features for displacement impacts. A conclusion of no AEoSI was determined for all

sites and features based on the Applicant's approach not reaching the threshold for PVA assessment which the Applicant considers the most realistic scenario and all SNCB scenarios indicating a reduction of no more than 2.5% in population size for any site and feature after 35 years.

6.4.2 Determination of AeoSI for In-combination impacts with other projects.

Sites and features assessed for impacts in-combination with other projects are summarised in **Table 97**.

6.4.2.1 Guillemot

Sites and guillemot feature assessed for displacement impacts in-combination with other projects representing the PVA 35 year outputs are summarised in **Table 97**Table 97.

Table 97. Summary of assessed sites for guillemot feature from displacement impacts in-combination with other projects.

Site	Counterfactual Median Growth rate*	Counterfactual Median Population Size*	In-combination additional annual mortality as % of population**	Additional annual mortality contributed by the Project***	Additional annual mortality as % of population contributed by the Project	AEoSI
Buchan Ness to Collieston Coast SPA						
	1.000 – 0.998	0.987 – 0.941	0.03 – 0.15%	5.1 – 28.2	0.01 – 0.06%	No
Troup, Pennan and Lion's Head SPA						
	1.000 – 0.998	0.984 – 0.925	0.04 – 0.18%	2.3 – 11.8	0.007 – 0.03%	No
East Caithness SPA						
	0.999 – 0.994	0.960 – 0.795	0.10 – 0.32%	13 – 60	0.006 – 0.03%	No
Fowlsheugh SPA						
	0.998 – 0.990	0.935 – 0.705	0.16 – 0.86%	2.4 – 8.6	0.002 – 0.009%	No
Copinsay SPA						
	1.000 – 1.000	0.994 – 0.986	0.01 – 0.03%	0.8 – 3.6	0.003 – 0.01%	No
North Caithness SPA						
	0.999 – 0.997	0.976 – 0.910	0.05 – 0.23%	4 – 16.4	0.007 – 0.03%	No

Values given for the range of impacts representing scenarios which include Berwick Bank, **Range of mortalities represents all scenarios which include Berwick Bank, * Range of mortalities represents all scenarios, Applicant's and SNCB's.*

A conclusion of no AEoSI was determined for all sites with guillemot as a feature on the basis that the Applicant's approach is considered the most realistic scenario. This has considered the best available evidence (APEM, 2022) and latest studies from operational

monitoring reports at the Beatrice OWF (MacArthur Green, 2021 and 2023). Analysis from data for both year one and two indicated no significant displacement impacts for guillemot, furthermore these behavioural responses to an OWF are from birds of the same colonies being assessed for the Project. Therefore, the Applicant's scenario (lower range values in **Table 97**) are considered most appropriate and still over precautionary given the latest evidence on guillemot displacement behaviour (MacArthur Green, 2021 and 2023). Results from the PVA using the Applicant's approach demonstrate a reduction of no more than 6.5% in population size for any site and feature after 35 years. Furthermore, the additional annual mortality contributed by the Project does not exceed 0.01% (or 1 in 10,000 birds) of the population assessed for any site and all sites demonstrate long term and/or recent colony growth trends.

6.4.2.2 Razorbill

Sites and razorbill feature assessed for displacement impacts in-combination with other projects representing the PVA 35-year outputs are summarised in **Table 98**.

Table 98. Summary of assessed sites for razorbill feature from displacement impacts in-combination with other projects.

Site	Counterfactual Median Growth rate*	Counterfactual Median Population Size*	In-combination additional annual mortality as % of population**	Additional annual mortality contributed by the Project***	Additional annual mortality as % of population contributed by the Project	AEoSI
Troup, Pennan and Lion's Head SPA						
	0.999 – 0.997	0.971 – 0.889	0.06 – 0.27%	0.2 – 1.2	0.003 – 0.01%	No
East Caithness SPA						
	0.999 – 0.993	0.950 – 0.782	0.12 – 0.57%	0.7 - 4.2	0.001 – 0.01%	No
Fowlsheugh SPA						
	0.999 – 0.993	0.954 – 0.785	0.10 – 0.56%	0.001 – 0.004	<0.0001%	No

Values given for the range of impacts representing scenarios which include Berwick Bank, **Range of mortalities represents all scenarios which include Berwick Bank, * Range of mortalities represents all scenarios.*

A conclusion of no AEoSI was determined for all sites with razorbill as a feature on the basis that the Applicant's approach is considered the most realistic scenario. This has considered the latest evidence from operational monitoring studies at the Beatrice OWF (MacArthur Green, 2021 and 2023). Analysis from data for both year one and two indicated no significant displacement impacts for razorbill, furthermore these behavioural responses to an OWF are from birds of the same colonies being assessed for the Project. Therefore, the Applicant's scenario (lower range values in **Table 98**) are considered most appropriate and still over precautionary given the latest evidence on razorbill displacement behaviour (MacArthur Green, 2021 and 2023). Results from the PVA using the Applicant's approach demonstrate a reduction of no more than 5.0% in population size for any site and feature after 35 years. Furthermore, the additional annual mortality contributed by the Project does not exceed 1

bird for any site assessed and all sites demonstrate long term and recent colony growth trends.

6.4.2.3 Puffin

Sites and puffin feature assessed for displacement impacts in-combination with other projects representing the PVA 35-year outputs are summarised in **Table 99.**

Table 99. Summary of assessed sites for puffin feature from displacement impacts in-combination with other projects.

Site	Counterfactual Median Growth rate*	Counterfactual Median Population Size*	In-combination additional annual mortality as % of population**	Additional annual mortality contributed by the Project***	Additional annual mortality as % of population contributed by the Project	AEoSI
Forth Islands SPA						
	0.995 – 0.969	0.829 – 0.327	0.43 – 2.60%	0.15 - 0.8	0.001 – 0.007%	No

Values given for the range of impacts representing scenarios which include Berwick Bank, **Range of mortalities represents all scenarios which include Berwick Bank, * Range of mortalities represents all scenarios.*

A conclusion of no AEoSI was determined for Forth Islands SPA with puffin as a feature on the basis that the Applicant's approach is considered the most realistic scenario. This has considered the latest evidence from operational monitoring studies at the Beatrice OWF (MacArthur Green, 2021 and 2023). Analysis from data for both year one and two indicated displacement rates for puffin to be realistically at a level of 30%. Therefore, the Applicant's scenario (lower range values in **Table 99**) are considered most appropriate and still over precautionary given the latest evidence on puffin displacement behaviour (MacArthur Green, 2021 and 2023). Although the results from the PVA using the Applicant's approach demonstrate a reduction of 17.1% in population size after 35 years, the additional annual mortality contributed by the Project is considerably less than 1 bird and therefore there is no tangible contribution from the Project to the in-combination impact.

6.4.2.4 Kittiwake

Sites and kittiwake feature assessed for combined displacement and collision impacts in-combination with other projects representing the PVA 35-year outputs are summarised in **Table** 100**.**

Table 100. Summary of assessed sites for kittiwake feature from combined impacts in-combination with other projects.

Site	Counterfactual Median Growth rate*	Counterfactual Median Population Size*	In-combination additional annual mortality as % of population**	Additional annual mortality contributed by the Project***	Additional annual mortality as % of population contributed by the Project	AEoSI
Buchan Ness to Collieston Coast SPA						
	0.995 – 0.996	0.865 – 0.828	0.33 – 0.43	0.8 – 1.4	0.003 - 0.006%	No
Troup, Pennan and Lion's Head SPA						
	0.996 – 0.994	0.865 – 0.811	0.34 – 0.48	0.7 - 1.1	0.003 – 0.005%	No
East Caithness SPA						
	0.990 – 0.993	0.777 – 0.698	0.58 – 0.84	0.8 – 1.6	0.001 – 0.003%	No
Forth Islands SPA						
	0.991 - 0.986	0.725 – 0.597	0.75 – 1.16%	0.1 - 0.18	0.001 – 0.002%	No
Fowlsheugh SPA						
	0.993 – 0.989	0.770 – 0.680	0.60 – 0.90%	0.5 – 0.9	0.001 - 0.003%	No
North Caithness SPA						
	0.995 – 0.993	0.839 – 0.787	0.35 – 0.56%	0.1 - 0.3	0.001 – 0.002%	No
St Abb's Head to Fast Castle SPA						
	0.968 – 0.948	0.311 – 0.146	2.67 – 4.37%	0.1 - 0.2	0.001 – 0.002%	No
West Westray SPA						
	0.990 – 0.986	0.687 – 0.598	0.87 – 1.20%	0.12 – 0.3	0.002 – 0.005%	No

Values given for the range of impacts representing scenarios which include Berwick Bank, **Range of mortalities represents all scenarios which include Berwick Bank, * Range of mortalities represents all scenarios.*

A conclusion of no AEoSI was determined for all sites with kittiwake as a feature on the basis that the Applicant's approach is considered the most realistic scenario. Furthermore, all scenarios are considered over precautionary given the impacts for displacement and collision are combined for the assessment. The latest evidence from operational monitoring studies at the Beatrice OWF (MacArthur Green, 2021 and 2023) suggest no evidence of displacement behaviour of kittiwakes from the OWF. Therefore, the Applicant's scenario (lower range

values in **Table 100**) are considered most appropriate and still over precautionary given that combining impacts or indeed including a displacement effect would result in over inflating mortality values. Although the results from the PVA using the Applicant's approach demonstrate a reduction in population size after 35 years, the additional annual mortality contributed by the Project is considerably less than 1 bird and therefore there is no tangible contribution from the Project to the in-combination impact.

6.4.2.5 Gannet

Sites and gannet feature assessed for combined displacement and collision impacts in-combination with other projects representing the PVA 35-year outputs are summarised in **Table 101.**

Table 101. Summary of assessed sites for gannet feature from combined impacts in-combination with other projects.

Site	Counterfactual Median Growth rate*	Counterfactual Median Population Size*	In-combination additional annual mortality as % of population**	Additional annual mortality contributed by the Project***	Additional annual mortality as % of population contributed by the Project	AEoSI
Forth Islands SPA						
	0.994 – 0.991	0.809 – 0.727	0.50 – 0.74	5.8 - 7.6	0.003 – 0.005%	No
Hermaness, Saxa Vord and Valla Field SPA						
	0.998 – 0.998	0.938 – 0.915	0.14 – 0.20	0.87 – 1.2	0.001 – 0.002%	No

Values given for the range of impacts representing scenarios which include Berwick Bank, **Range of mortalities represents all scenarios which include Berwick Bank, * Range of mortalities represents all scenarios.*

A conclusion of no AEoSI was determined for all sites with gannet as a feature on the basis that all scenarios are considered over precautionary, as advice provided by NatureScot has not incorporated the latest scientific evidence.

- Firstly, the impacts for displacement and collision are combined for the assessment.

The latest guidance paper on avoidance rates for collision risk modelling (Cook, 2021) included acknowledgement of the double counting of collision risk and displacement for gannet and proposed that assessments of gannet should consider observed high levels of macro avoidance within collision risk modelling to reduce the over-inflation of impacts when combining the two together (APEM, 2014; Dierschke *et al*., 2016; Orsted, 2022). The issue of over-inflating displacement and collision when combining the two for assessing the potential impacts on gannet from OWFs is also noted in the joint SNCBs interim advice note on displacement (SNCBs, updated 2022). Therefore, incorporating a macro avoidance rate when

considering outputs for collision risk combined with displacement would significantly reduce the in-combination impacts.

- Secondly, gannet flight speed for collision modelling is not sourced from the most robust scientific evidence.

NatureScot's recommendation for gannet flight speed is from Pennycuick (1987), which is based on 32 cliff-based observations using an ornithodolite (Pennycuick, 1982) over a period of 12 days on the island of Foula. The instrument used is for flight speed estimates at short ranges of up to 295 m (Pennycuick, 1983) and with a position error of about 2.6 m at 100 m and 8 m at maximum range. The Applicant advocates the gannet flight speeds from the more recent study (Skov *et al.*, 2018) that used laser rangefinder tracking data to estimate flight speed both inside and outside the Thanet OWF from 706 tracks over a period of approximately two years. The Applicant considers such estimates on gannet flight speed to be more accurate and more representative of flight behaviour around offshore wind turbine generators in comparison to Pennycuick's cliff-based observations. Therefore, the in-combination assessment should rely upon the best available and most up-to-date scientific research on flight speeds to inform the assessment.

Both the above points have not been incorporated into the in-combination assessment considerably over inflating the output values generated from the PVA. Considering both macro-avoidance and the latest evidence of gannet flight speeds for CRM would significantly reduce the differences in population size suggested in **Table 101**. and the additional annual mortality contributed by the Project.

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Appendix 1 Predicted Monthly Collision Risk Modelling Results

Table 102. Monthly predicted collision rates for gannet.

Band Option 2				
Month	Applicant - Deterministic	Applicant - Stochastic	SNCB - Deterministic	SNCB - Stochastic
Jan	1.0	1.1 (0.7)	1.2	1.2 (0.7)
Feb	0.4	0.5 (0.3)	0.5	0.5 (0.3)
Mar	0.5	0.7 (0.4)	0.6	0.7 (0.4)
Apr	1.0	1.0 (0.6)	1.1	1.1 (0.6)
May	1.4	1.7 (1.1)	1.6	1.8 (1.1)
Jun	3.1	3.1 (1.8)	3.4	3.3 (1.9)
Jul	3.7	3.6 (2.0)	4.0	3.9 (2.0)
Aug	0.9	0.9 (0.5)	1.0	1.0 (0.5)
Sep	3.4	3.1 (1.4)	3.8	3.3 (1.3)
Oct	0.3	0.3 (0.2)	0.3	0.4 (0.2)
Nov	0.1	0.2 (0.2)	0.1	0.2 (0.2)
Dec	0.0	0.0 (0.0)	0.0	0.0 (0.0)
Annual	**15.8**	**16.2 (9.3)**	**17.6**	**17.5 (9.3)**

Table 103. Monthly predicted collision rates for kittiwake.

Band Option 2				
Month	Applicant - Deterministic	Applicant - Stochastic	SNCB - Deterministic	SNCB - Stochastic
Jan	0.5	0.7 (0.2)	0.9 – 1.2	0.9 (0.2)
Feb	0.3	0.3 (0.1)	0.4 – 0.5	0.4 (0.1)
Mar	0.8	0.9 (0.6)	1.1 – 1.4	1.2 (0.7)
Apr	0.5	0.5 (0.3)	0.8 – 0.9	0.7 (0.3)
May	0.6	0.6 (0.1)	0.9 – 1.0	0.8 (0.0)
Jun	1.4	1.5 (1.0)	1.9 – 2.1	2.0 (1.2)
Jul	1.7	1.7 (0.8)	2.4 – 2.6	2.2 (0.9)
Aug	0.1	0.1 (0.0)	0.1 – 0.2	0.1 (0.0)
Sep	1.1	1.2 (0.3)	1.7 – 2.0	1.6 (0.1)
Oct	0.4	0.4 (0.1)	0.6 – 0.7	0.6 (0.0)
Nov	1.1	1.4 (0.7)	1.8 – 2.4	1.9 (0.9)
Dec	0.7	1.1 (0.7)	1.1 – 1.6	1.4 (0.8)
Annual	**9.1**	**10.6 (4.9)**	**13.8 – 16.5**	**13.9 (5.3)**

Table 104. Monthly predicted collision rates for herring gull.

Band Option 2				
Month	Applicant - Deterministic	Applicant - Stochastic	SNCB - Deterministic	SNCB - Stochastic
Jan	3.0	3.6 (0.8)	3.7 – 5.0	4.3 (0.6)
Feb	0.3	0.3 (0.1)	0.4 – 0.5	0.4 (0.1)
Mar	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Apr	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
May	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Jun	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Jul	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Aug	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Sep	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Oct	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Nov	0.1	0.3 (0.2)	0.2 – 0.2	0.3 (0.2)
Dec	0.3	0.5 (0.3)	0.3 – 0.5	0.6 (0.4)
Annual	**3.8**	**4.7 (1.4)**	**4.6**	**5.8 (1.4)**

Table 105. Monthly predicted collision rates for great black-backed gull.

Band Option 2				
Month	Applicant - Deterministic	Applicant - Stochastic	SNCB - Deterministic	SNCB - Stochastic
Jan	2.3	2.9 (0.7)	2.9 – 4.0	3.8 (0.6)
Feb	0.5	0.6 (0.3)	0.7 – 0.8	0.8 (0.4)
Mar	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Apr	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
May	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Jun	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Jul	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Aug	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Sep	0.0	0.0 (0.0)	0.0 – 0.0	0.0 (0.0)
Oct	0.4	0.4 (0.1)	0.5 – 0.6	0.6 (0.1)
Nov	0.6	0.9 (0.6)	0.7 – 1.0	1.1 (0.7)
Dec	0.3	0.4 (0.3)	0.4 – 0.5	0.5 (0.3)
Annual	**4.1**	**5.4 (2.0)**	**5.1 – 6.9**	**3.8 (2.2)**

Appendix 2 Consideration of impacts to European storm petrel

The Applicant provided a detailed assessment of the predicted abundance and occurrence of storm petrel over the Project area and considered the potential effects from artificial light in the **EIA Report Chapter 12, Section 12.8.2**. In response to continued concerns raised by the RSPB during consultation (see **Table 1**, item 28) around the impacts on European storm-petrels the Applicant has provided further information on the RSPBs main issues of concern:

- The potential inadequacy of the survey method to detect birds.

The predicted abundance of storm petrel derived from the Project specific surveys were as would be expected given all current evidence from distribution usage models published by Waggit *et al*., (2019) and Bolton *et al*., (2020). While storm petrels are known to be active nocturnally their activity was shown to be closer to colonies and not in the vicinity of the Project area as demonstrated in the study of Bolton *et al*., (2021). The Applicant is therefore confident that the survey method was fit for purpose and has not compromised the assessment for storm petrel, as it is unlikely that surveys missed key active periods and the usage of the Project area by storm petrels was in the densities expected for the survey area.

- The lack of consideration of attraction to lights and consequent disorientation.

As described in the Green Volt Environmental Impact Assessment, there is potential for birds to be attracted to artificial lighting on WTGs. The potential positive and negative impacts of such lighting is described within the **EIA Report Chapter 12, Section 12.11.9**. During operation, OWF sites are marked in accordance with current aviation and navigational lighting guidance and policy. In general aviation and navigational lighting requirements are that peripheral structures such as WTGs, where more than 900m apart, are lit with a single medium intensity (2000 candela) flashing red aviation light at the top of the nacelle. When visibility exceeds 5 km light intensity is reduced to 10 % (200 candela).

The RSPB cite evidence presented in a recent review by Deakin *et al*. (2023) published in December 2022, on storm petrel attraction to artificial light for inadequate consideration of potential impacts. The Applicant reviewed all available literature at the time of writing the EIA Report including publications cited in the Deakin *et al*. (2023) review. The Applicant notes that evidence cited by the RSPB for inadequate assessment to lighting impacts are from behaviours observed in proximity to the colony or gas flares. This type of evidence cannot be translated with any certainty to at-sea behaviour to turbine lighting and will also suffer from reporting bias of an observed effect. Therefore, studies of bird collisions with other anthropogenic structures such as buildings, towers or offshore oil and gas platforms (Ronconi et al., 2015) that have been found to cause a high risk of collision may not necessarily reflect the situation at OWFs during their operational phase. Indeed, there are several studies that indicate that the use of flashing light, as would be used on WTGs, leads to a reduced amount of attraction/ collision. Much evidence of grounding by European storm petrels due to artificial lighting comes from coastal observations. Deakin *et al* (2023) acknowledge that behaviour towards artificial lighting at the colonies may be different to at-sea behaviour,

meaning there is uncertainty around how nocturnally foraging birds react to the potential impact. Indeed, the comprehensive review on seabird strandings attributed to light attraction by Brown *et al*., (2022) highlight the lack of appropriate studies and identify where evidence may be lacking or subject to confirmation bias.

With reference to the **Green Volt Report to Inform Appropriate Assessment**, the Applicant considers that due consideration has been given to the current evidence and together with the species observed low flight height behaviour the risk of collision to turbines from light attraction is low. Therefore, and in agreement with the conclusions reached by NatureScot an AEoSI from the impacts of the Project on the storm petrel populations of Mousa SPA and Sule Skerry and Sule Stack SPA can be ruled out.

GREEN VOLT

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