



Bowdun Offshore Wind Farm, Report to Inform Appropriate Assessment

Part 3, Appendix 3B: Offshore Ornithology SPA
Population Viability Analysis Technical Report

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Glossary

Defined Term	Definition
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Digital Aerial Surveys (DAS)	A method for undertaking baseline ornithological and marine mammal data collection surveys. Usually undertaken over a period of 24 months.
Displacement	An impact that occurs when an animal is forced away from an area of habitual usage. This can be temporary (i.e. a ship moving) or permanent (i.e. the placement of offshore infrastructure).
Effect	Term used to express the consequence of an impact (i.e. the result of change or changes on specific environmental resources or receptors). The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
Export Cable Corridor	The area seaward of MHWS which connects the Array Area with the Landfall within which the Offshore Export Cables will be installed.
Habitats Regulations Appraisal (HRA)	An assessment carried out under the Habitats Regulations to determine if a plan or project could adversely affect the integrity of a European Site.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the OSPs.
Population Viability Analysis (PVA)	Numerical modelling of a population which looks at the difference between the baseline (counterfactual) and impacted scenarios. PVA is used to understand how the population growth rate and population size is affected by the predicted impact.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Report to Inform Appropriate Assessment (RIAA), Part 1: Introduction
Report to Inform Appropriate Assessment (RIAA)	The RIAA provides detailed information to support the process of AA (undertaken by the competent authority) as part of the HRA, which evaluates the potential impacts of a project or plan on European Sites.
Scoping Opinion	A document produced by MD-LOT which is issued in response to submission and review of the Offshore Scoping Report. The Scoping Opinion is supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.

Defined Term	Definition
Special Protection Areas (SPAs)	SPAs are sites that are designated to protect rare or vulnerable birds (as listed on Annex I of the Directive 2009/147/EC on the conservation of wild birds), as well as regularly occurring migratory species.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Thistle Wind Partners (TWP)	Company established for the development of the Project.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
CPGR	Counterfactual of the Population Growth Rate
CPS	Counterfactual of Population Size
CRM	Collision Risk Modelling
EIA	Environmental Impact Assessment
HRA	Habitats Regulations Appraisal
LiDAR	Light Detection and Ranging
MD-LOT	Marine Directorate–Licensing Operations Team
MLS	Most Likely Scenario
OWF	Offshore Wind Farm
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
sCRM	Stochastic Collision Risk Model
SPA	Special Protection Area
WCS	Worst Case Scenario

1 Introduction

1.1 Background

- 1.1.1 Offshore wind developments can cause seabird mortalities through collision with Wind Turbine blades and cause distributional responses, displacement and/or barrier effects due to the presence of Wind Turbines within the Array Area. The impact of offshore wind developments on seabird populations can be considered as Proposed Development alone impacts or as in-combination impacts (with the Proposed Development alone impacts considered alongside the impacts of other projects on the same feature of the SPA).
- 1.1.2 This technical report outlines the methodology and findings from modelling the potential impacts of the Bowdun Offshore Wind Farm (OWF) (hereafter referred to as the ‘Proposed Development’) on the Special Protection Areas (SPAs) in relation to protected bird species. The results presented in this technical report inform the assessment and conclusions detailed in the Report to Inform Appropriate Assessment (RIAA).
- 1.1.3 A Population Viability Analysis (PVA) model was conducted to assess the potential impact of the Proposed Development on populations of seabird species. PVAs use statistical population models to predict how developments will alter a population over a set period of time. Outputs of PVAs provide a comparison between ‘baseline’ conditions whereby populations are unimpacted, and ‘scenario’ conditions whereby populations have been impacted through changes in demographic parameters.
- 1.1.4 The population metrics derived from the PVAs can be used to determine the potential significance of the impacts from the Proposed Development alone and in-combination with other projects. Due to the sensitivity of the model to demographic parameters, PVAs can predict population trends which are contrary to observed trends. Therefore, to determine the potential significance of the impacts from the Proposed Development alone or in-combination with other projects it is recommended to use the magnitude of difference between the ‘baseline’ and ‘scenario’ conditions.
- 1.1.5 Seabird species and related populations were selected for PVA for the Proposed Development alone impacts where the predicted change was equal to or greater than a 0.02 percentage point decrease in survival (NatureScot, 2023; Marine Directorate – Licensing Operations Team (MD-LOT), 2024).
- 1.1.6 For the in-combination impacts, seabird species and related populations were taken forward for assessment if both the following thresholds were met:
- the Proposed Development alone mortality was equal to or greater than 0.2 birds per annum (MD-LOT, 2024); and
 - the in-combination impact was equal to or greater than 0.02 percentage point decrease in survival (MD-LOT, 2024).

1.1.7 The Proposed Development alone and in-combination PVAs required as part of the RIAA are as follows:

- Northern gannet *Morus bassanus* (hereafter referred to as ‘gannet’);
 - Fair Isle SPA (in-combination impacts only);
 - Flamborough and Filey Coast SPA (in-combination impacts only);
 - Forth Islands SPA (in-combination impacts only);
 - Hermaness, Saxa Vord and Valla Field SPA (in-combination impacts only);
 - North Rona and Sula Sgeir SPA (in-combination impacts only);
 - Noss SPA (in-combination impacts only); and
 - Sule Skerry and Sule Stack SPA (in-combination impacts only).
- Black-legged kittiwake *Rissa tridactyla* (hereafter referred to as ‘kittiwake’);
 - Buchan Ness to Collieston Coast SPA (Proposed Development alone and in-combination impacts);
 - East Caithness Cliffs SPA (in-combination impacts only);
 - Farne Islands SPA (in-combination impacts only);
 - Flamborough and Filey Coast SPA (in-combination impacts only);
 - Forth Islands SPA (in-combination impacts only);
 - Fowlsheugh SPA (Proposed Development alone and in-combination impacts);
 - North Caithness Cliffs SPA (in-combination impacts only);
 - St Abb’s Head to Fast Castle SPA (in-combination impacts only);
 - Troup, Pennan and Lion’s Heads SPA (in-combination impacts only); and
 - West Westray SPA (in-combination impacts only).
- European herring gull *Larus argentatus* (hereafter referred to as ‘herring gull’);
 - Buchan Ness to Collieston Coast SPA (Proposed Development alone and in-combination impacts); and
 - Fowlsheugh SPA (Proposed Development alone and in-combination impacts).
- common guillemot *Uria aglae* (hereafter referred to as ‘guillemot’);
 - Buchan Ness to Collieston Coast SPA (Proposed Development alone and in-combination impacts); and

- Fowlsheugh SPA (Proposed Development alone and in-combination impacts).
- razorbill *Alca torda*;
 - Forth Islands SPA (Proposed Development alone and in-combination impacts);
 - Fowlsheugh SPA (Proposed Development alone and in-combination impacts);
 - St Abb’s Head to Fast Castle SPA (Proposed Development alone and in-combination impacts); and
 - Troup, Pennan and Lion’s Heads SPA (Proposed Development alone and in-combination impacts).
- Atlantic puffin *Fratercula arctica* (hereafter referred to as ‘puffin’);
 - Coquet Island SPA (in-combination impacts only);
 - Farne Islands SPA (in-combination impacts only); and
 - Forth Islands SPA (in-combination impacts only).

1.1.8 No PVAs were required for either the Proposed Development alone or in-combination scenarios for Arctic tern *Sterna parasiticus* or great black-backed gull *Larus marinus* as the percentage point change in survival did not meet the 0.02 threshold and the Proposed Development alone mortalities did not meet the 0.2 threshold for in-combination assessment.

1.1.9 No Proposed Development alone PVAs were required for fulmar *Fulmarus glacialis* as the percentage point change in survival did not reach the 0.02 threshold. However, four SPAs assessed for fulmar were found to reach the 0.2 Proposed Development alone mortality threshold:

- East Caithness Cliffs SPA;
- Fair Isle SPA;
- Hoy SPA; and
- North Caithness Cliffs SPA.

1.1.10 Despite these four sites reaching the first threshold required for in-combination PVA, an in-combination assessment for fulmar has not been presented. As recognised within the Habitats Regulations Appraisal (HRA) Screening Response (MD-LOT, 2024), fulmar have only recently started being assessed. At the time of writing this report, only two applications, West of Orkney OWF (Offshore Wind Power Limited, 2024a) and Ayre OWF (TWP, 2025), have included the assessment for distributional responses for fulmar and therefore it is considered that there is not enough information available to provide an accurate assessment. It should also be noted that using these three OWFs, only East Caithness Cliffs SPA would meet the 0.02 percentage point change in survival (a total of 0.96 to 2.85 mortalities; 0.01 to 0.02 percentage point change).

2 Methodology

2.1.1 PVA was undertaken using the Seabird PVA Tool developed by Natural England (Searle *et al.*, 2019). This software is written in ‘R’, a free software environment for statistical computing and graphics. All work was conducted using R version 4.4.2 for Windows (R Core Team, 2024).

2.1 Modelling Approach

2.1.1 All PVA models were run using the same modelling approach as the PVAs for the Offshore Environment Impact Assessment (EIA) Report (see the Offshore EIA Report, Volume 3, Technical Appendix 11.7: Offshore Ornithology Population Viability Analysis Technical Report (TWP-BOW-RPS-OFE-RPT-00025)).

2.1.2 To compare baseline and impacted scenarios, two metrics can be used: the Counterfactual of the Population Size (CPS) or the Counterfactual of the Population Growth Rate (CPGR). As models within this technical report have been run using density independence, the CPGR is considered more robust and informative than the CPS. While both the CPGR and CPS are provided as requested (NatureScot, 2023), the interpretation of the density independence PVA outputs focusses on the CPGR, with the CPS provided as a complementary metric.

2.2 Simulation Parameters

2.2.1 All simulations were set to run 5,000 iterations to ensure robust results (a minimum of 1,000 simulations are required for reliable results (Searle *et al.*, 2019)). A five-year burn in period was used to allow for a stable age structure to form prior to modelling the population outputs. This is in line with other consented projects such as West of Orkney OWF (Offshore Wind Power Limited, 2024b).

2.2.2 PVAs were run for a 50-year period (to include the operational lifetime of the Proposed Development (30 years) and beyond) as recommended by NatureScot (2023). Results are presented for both the operational lifetime (30 years) and 50-year period. However, results for the operational lifetime have been used to determine the significance of impacts within the RIAA as this period is considered the most indicative of the real-life impacts of the Proposed Development.

2.2.3 As advised in the Scoping Opinion (MD-LOT, 2024), the in-combination assessment was conducted including and excluding Berwick Bank OWF for relevant species as the outcome of the Berwick Bank OWF application was unknown at the time of the Scoping Opinion. Although Berwick Bank OWF has since been granted consent from Scottish Ministers (MD-LOT, 2025), scenarios including and excluding Berwick Bank OWF have been presented to follow the advice in the Scoping Opinion.

2.2.4 Impacted and baseline comparisons were constructed using a matched runs approach, whereby stochasticity is applied to the population before impacts are applied (i.e. survival and productivity rates simulated at each time step are the same for the baseline and impacted populations before additional impact mortalities are deducted from simulated survivals for the impacted populations). This approach has been used as previous analyses demonstrated that stochastic models using a matched runs approach were likely to be the most precautionary (Cook and Robinson, 2017). Productivity rates used within the analysis were therefore unaffected by impacts from the OWF.

2.3 Model Parameters

Demographic Rates

2.3.1 The survival rates for the species requiring PVA were derived from the national values presented in Horswill and Robinson (2015) (Table 2.1) These values often matched the default values within the Seabird PVA Tool (Searle *et al.*, 2019). In cases where the values within the tool differed, Horswill and Robinson (2015) values were used. In cases where the standard deviation for demographic rates could not be derived from Horswill and Robinson (2015) and no values were presented within the tool, a value of 0.001 was used.

2.3.2 Survival rates (Table 2.1) vary depending on age class, with 0 to 1 used to present birds below the age of one, age class 1 to 2 used to represent birds aged one and so on. Adults are grouped together as survival rates are consistent between adult aged birds regardless of actual age (e.g. seven-year-olds have the same survival rate as eight-year-olds and so on).

Table 2.1: Demographic Rates for Key Species Used in Population Viability Analysis, Derived from Horswill and Robinson (2015). Standard Deviations (SD) are Provided in Parentheses

Species ¹	Age at First Breeding	Eggs/ pair	Survival by Age Class (Years)							Productivity (Chicks per Pair)
			0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	Adult	
Gannet	5	1	0.424 (0.045)	0.829 (0.026)	0.891 (0.019)	0.895 (0.019)	0.919 (0.042)	-	0.919 (0.042)	0.700 (0.082)
Kittiwake	4	2	0.790 (0.001)	0.854 (0.077)	0.854 (0.077)	0.854 (0.077)	-	-	0.854 (0.077)	0.690 (0.296)
Herring gull	5	3	0.798 (0.092)	0.834 (0.079)	0.834 (0.079)	0.834 (0.079)	0.834 (0.079)	-	0.834 (0.079)	0.920 (0.477)
Guillemot	6	1	0.560 (0.058)	0.792 (0.152)	0.917 (0.098)	0.939 (0.025)	0.939 (0.025)	0.939 (0.025)	0.939 (0.025)	0.672 (0.147)
Razorbill	5	1	0.794 (0.209)	0.794 (0.209)	0.895 (0.067)	0.895 (0.067)	0.895 (0.067)	-	0.895 (0.067)	0.570 (0.247)
Puffin	5	1	0.892 (0.001)	0.892 (0.001)	0.892 (0.001)	0.760 (0.093)	0.805 (0.083)	-	0.906 (0.083)	0.617 (0.151)

¹ Fulmar, great black-backed gull and Arctic tern were not included as no PVAs were performed

Impact Scenarios

- 2.3.3 Impacts due to both collision and displacement are considered within this report. The impact of collision only is considered for Arctic tern, herring gull and great black-backed gull. The impact of displacement only is considered for fulmar, guillemot, razorbill and puffin. The impact of displacement and collision combined are considered for both gannet and kittiwake. The process for screening in impacts for each species is outlined in Section 3 of the RIAA: RIAA, Part 3: Special Protection Areas and Ramsar Sites (TWP-BOW-RPS-ENV-RPT-00015) and Volume 3, Technical Appendix 11.1: Offshore Ornithology Baseline Characterisation Report (TWP-BOW-RPS-OFE-RPT-00020).
- 2.3.4 For the Proposed Development alone PVAs which include collision impacts, values were taken from the Offshore EIA Report, Volume 3, Technical Appendix 11.4: Offshore Ornithology Collision Risk Model Technical Report (TWP-BOW-RPS-OFE-RPT-00022). For all species, CRM was carried out using Option 2 of the stochastic Collision Risk Model (sCRM), which incorporates generic flight heights from Johnston *et al.* (2014), and the Worst-Case Scenario (WCS). Additional CRM was carried out for kittiwake using Option 1 of the sCRM and the Most Likely Scenario (MLS), which allows for the incorporation of site-specific data collected using Light Detection and Ranging (LiDAR) commissioned by TWP.
- 2.3.5 For more information see the RIAA, Part 3: Special Protection Areas and Ramsar Sites (TWP-BOW-RPS-ENV-RPT-00015).
- 2.3.6 For the Proposed Development alone PVAs which include displacement impacts, values were taken from the Offshore EIA Report, Volume 3, Technical Appendix 11.3: Offshore Ornithology Displacement Technical Report (TWP-BOW-RPS-OFE-RPT-00021). For the purpose of this report, displacement mortality estimates for the O&M phase have been used. For more information, see the RIAA, Part 3: SPA and Ramsar Sites (TWP-BOW-RPS-ENV-RPT-00015).
- 2.3.7 As the RIAA focuses on breeding adults only, mortality estimates were adjusted using stable age structures derived from Horswill and Robinson (2015) or information within the full Digital Aerial Survey dataset before apportioning impacts to the relevant SPAs (see Appendix 3A: Offshore Ornithology Special Protection Area Apportioning Technical Report (TWP-BOW-RPS-ENV-RPT-00038)).
- 2.3.8 Proposed Development alone impacts were carried forward to the in-combination PVA, alongside the impacts of other OWFs which were derived from Grant (2025) for all projects except Aspen OWF, Ayre OWF and Buchan OWF as the application for these OWFs were submitted following the collation of mortalities by Grant (2025). For more information see the RIAA, Part 3: Special Protection Areas and Ramsar Sites (TWP-BOW-RPS-ENV-RPT-00015).
- 2.3.9 For in-combination PVA, ‘as-built’ and ‘consented’ scenarios were modelled where appropriate. For the ‘consented’ scenario, collision mortalities included are the number of mortalities derived from the project’s application. Whereas for the ‘as-built’ scenario, collision mortalities included use the parameters of the built wind farm rather than the WCS. As turbine parameters are not used

within displacement analysis, ‘as-built’ and ‘consented’ values are only presented for species assessed for collision risk. As only one project (Aberdeen OWF) impacting herring gull within Grant (2025) was found to be affected by ‘as-built’ corrections, only one in-combination scenario using consented collisions has been presented for herring gull.

In-combination Mortalities

2.3.10 In order to assess the impact of the Proposed Development in-combination with other projects, the predicted mortalities for the relevant projects were collated using information provided by Grant (2025). As the applications were submitted for Aspen OWF (Cerulean Winds Aspen Project Limited, 2025), Ayre OWF (TWP, 2025) and Buchan OWF (Buchan Offshore Wind, 2025) following the work by Grant (2025) mortalities for these projects have been taken from the project application themselves. Within this work, information provided in the Berwick Bank OWF (SSE Renewables, 2022) was used as the basis of the work carried out by Grant (2025), with numbers updated using the most recently submitted application as well as Preliminary Environmental Information Reports (PEIR) for English and Welsh projects where necessary.

2.3.11 Grant (2025) presents two scenarios within their work ‘consented’ and ‘as-built’. As-built corrections used within Grant (2025) were determined within MacArthur Green (2017).

2.4 Input Parameters

2.4.1 Table 2.2 to Table 2.11 present the extent to which predicted mortalities from collision risk and displacement reduce the survival rate of breeding adults for the relevant species. It is these reductions in survival rates that are used within the model to inform the ‘impacted’ scenario. Only SPAs which have been screened in for the assessment have been presented (see Table 3.7 of RIAA, Part 3: Special Protection Areas and Ramsar Sites (TWP-BOW-RPS-ENV-RPT-00015))

Fulmar

2.4.2 Displacement impacts from the Array Area did not exceed the 0.02 percentage point threshold for any SPA for fulmar populations (Table 2.2). Therefore, no Proposed Development alone PVAs were conducted for this species.

2.4.3 In order to be considered for in-combination PVA, mortalities from the Proposed Development alone for an SPA must be greater than 0.2 individuals. For fulmar, four sites met this threshold:

- East Caithness Cliffs SPA;
- Fair Isle SPA;
- Hoy SPA; and
- North Rona and Sula Sgeir SPA.

2.4.4 Although impacts to four SPAs were met the 0.2 mortality threshold, in-combination impacts were not considered as fulmar have only recently started to be assessed quantitatively within displacement analysis for OWFs, meaning there is limited information available.

Table 2.2: Fulmar Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change)		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
Basket Islands	3,768	0.00	0.00	0.000	0.000	No
Buchan Ness to Collieston Coast	1,652	0.06	0.15	0.004	0.009	No
Calf of Eday	4,648	0.01	0.02	0.000	0.000	No
Cape Wrath	2,954	0.00	0.01	0.000	0.000	No
Clare Island	5,294	0.00	0.00	0.000	0.000	No
Cliffs of Moher	9,602	0.00	0.00	0.000	0.000	No
Copinsay	3,236	0.01	0.02	0.000	0.001	No
Deenish and Scariff Island	802	0.00	0.00	0.000	0.000	No
Dingle Peninsula	1,620	0.00	0.00	0.000	0.000	No
Duvillaun Island	1,094	0.00	0.00	0.000	0.000	No
East Caithness Cliffs	27,928	0.11	0.25	0.000	0.001	No
Fair Isle	64,982	0.14	0.32	0.000	0.000	No
Fetlar	18,354	0.03	0.06	0.000	0.000	No
Flamborough and Filey Coast	1,692	0.00	0.01	0.000	0.001	No
Flannan Isles	6,132	0.00	0.01	0.000	0.000	No
Foula	20,506	0.05	0.11	0.000	0.001	No
Fowlsheugh	1,050	0.04	0.11	0.004	0.010	No
Handa	1,446	0.00	0.00	0.000	0.000	No
Hermaness, Saxa Vord and Valla Field	26,416	0.02	0.06	0.000	0.000	No
High Island, Inishshark and Davillaun	3,982	0.00	0.00	0.000	0.000	No

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change)		Taken Forward for PVA
		Low	High	Low	High	
Horn Head to Fanad Head	1,316	0.00	0.00	0.000	0.000	No
Hoy	41,082	0.11	0.26	0.000	0.001	No
Iveragh Peninsula	2,060	0.00	0.00	0.000	0.000	No
Kerry Head	602	0.00	0.00	0.000	0.000	No
Lambay Island	750	0.00	0.00	0.000	0.000	No
Mingulay and Berneray	14,096	0.00	0.01	0.000	0.000	No
North Caithness Cliffs	30,740	0.09	0.21	0.000	0.001	No
North Rona and Sula Sgeir	4,420	0.00	0.01	0.000	0.000	No
Noss	10,184	0.02	0.04	0.000	0.000	No
Puffin Island	1,340	0.00	0.00	0.000	0.000	No
Rathlin Island	2,076	0.00	0.00	0.000	0.000	No
Rousay	4,384	0.01	0.02	0.000	0.000	No
Saltee Islands	714	0.00	0.00	0.000	0.000	No
Shiant Isles	3,012	0.00	0.00	0.000	0.000	No
Skelligs	1,834	0.00	0.00	0.000	0.000	No
St Kilda	58,372	0.02	0.05	0.000	0.000	No
Sumburgh Head	11,900	0.01	0.03	0.000	0.000	No
Tory Island	1,014	0.00	0.00	0.000	0.000	No
Troup, Pennan and Lion's Heads	3,788	0.04	0.10	0.001	0.003	No
West Donegal Coast	2,836	0.00	0.00	0.000	0.000	No
West Westray	2,428	0.00	0.01	0.000	0.000	No

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

Gannet

- 2.4.5 For the Proposed Development alone, the combined impact of displacement and collision risk from the Array Area did not exceed the 0.02 percentage point threshold for decrease in survival for any SPA (Table 2.3). Therefore, no Proposed Development alone PVAs were conducted for this species.
- 2.4.6 The in-combination mortalities were only collated for any SPAs which met the 0.2 threshold for Proposed Development alone mortalities. As gannet were assessed for collision risk, both consented and as-built mortalities were collated including and excluding Berwick Bank. For gannet, the following eight sites met this threshold:
- Fair Isle SPA;
 - Flamborough and Filey Coast SPA;
 - Forth Islands SPA;
 - Hermaness, Saxa Vord and Valla Field SPA;
 - North Rona and Sula Sgeir SPA;
 - Noss SPA;
 - St Kilda SPA; and
 - Sule Skerry and Sule Stack SPA.
- 2.4.7 The combined impact of collision risk and displacement on gannet populations with connectivity to the Array Area, in-combination with other OWFs exceeded the 0.02 percentage point threshold for all SPAs listed in Paragraph 2.4.6, excluding St Kilda SPA, using both as-built and consented collisions. Therefore, in-combination PVAs were conducted under the as-built and consented scenarios for seven SPAs for gannet. The inclusion or exclusion of Berwick bank OWF did not alter which SPAs exceed the 0.02 percentage point decrease threshold for changes in survival rate (Table 2.3).

Table 2.3: Gannet Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
Fair Isle	9,942	0.26	0.35	0.003	0.004	No
Flamborough and Filey Coast	26,784	0.78	1.05	0.003	0.004	No
Forth Islands	150,518	19.92	26.48	0.013	0.018	No
Hermaness, Saxa Vord and Valla Field	59,124	0.72	0.99	0.001	0.002	No
North Rona and Sula Sgeir	24,542	0.30	0.40	0.001	0.002	No
Noss	27,530	0.50	0.67	0.002	0.002	No
St Kilda	120,580	0.76	1.00	0.001	0.001	No
Sule Skerry and Sule Stack	18,130	0.34	0.45	0.002	0.003	No
In-combination including Berwick Bank (consented collisions)						
Fair Isle	9,942	8.66	16.46	0.087	0.166	Yes
Flamborough and Filey Coast	26,784	279.61	440.91	1.044	1.646	Yes
Forth Islands	150,518	703.51	1,013.80	0.467	0.674	Yes
Hermaness, Saxa Vord and Valla Field	59,124	44.00	88.55	0.074	0.150	Yes
North Rona and Sula Sgeir	24,542	4.32	8.26	0.018	0.034	Yes
Noss	27,530	22.16	44.09	0.081	0.160	Yes
St Kilda	SPA not impacted by Berwick Bank (see 'In-combination excluding Berwick Bank (consented collisions)')					

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Sule Skerry and Sule Stack	18,130	26.38	36.94	0.146	0.204	Yes
In-combination excluding Berwick Bank (consented collisions)						
Fair Isle	9,942	8.20	15.55	0.082	0.156	Yes
Flamborough and Filey Coast	26,784	277.41	437.47	1.036	1.633	Yes
Forth Islands	150,518	562.80	807.71	0.374	0.537	Yes
Hermaness, Saxa Vord and Valla Field	59,124	42.02	84.44	0.071	0.143	Yes
North Rona and Sula Sgeir	24,542	4.13	7.75	0.017	0.032	Yes
Noss	27,530	21.12	42.05	0.077	0.153	Yes
St Kilda	120,580	4.19	6.35	0.003	0.005	No
Sule Skerry and Sule Stack	18,130	25.83	36.12	0.142	0.199	Yes
In-combination including Berwick Bank (as-built collisions)						
Fair Isle	9,942	8.25	16.04	0.083	0.161	Yes
Flamborough and Filey Coast	26,784	242.39	403.68	0.905	1.507	Yes
Forth Islands	150,518	695.49	1005.78	0.462	0.668	Yes
Hermaness, Saxa Vord and Valla Field	59,124	41.07	85.61	0.069	0.145	Yes
North Rona and Sula Sgeir	24,542	4.17	8.11	0.017	0.033	Yes
Noss	27,530	20.81	42.74	0.076	0.155	Yes
St Kilda	SPA not impacted by Berwick Bank (see 'In-combination excluding Berwick Bank (as-built collisions)')					

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Sule Skerry and Sule Stack	18,130	26.30	36.85	0.145	0.203	Yes
In-combination excluding Berwick Bank (as-built collisions)						
Fair Isle	9,942	7.78	15.13	0.078	0.152	Yes
Flamborough and Filey Coast	26,784	240.19	400.25	0.897	1.494	Yes
Forth Islands	150,518	554.78	799.69	0.369	0.531	Yes
Hermaness, Saxa Vord and Valla Field	59,124	39.08	81.50	0.066	0.138	Yes
North Rona and Sula Sgeir	24,542	3.98	7.60	0.016	0.031	Yes
Noss	27,530	19.77	40.70	0.072	0.148	Yes
St Kilda	120,580	4.19	6.35	0.003	0.005	No
Sule Skerry and Sule Stack	18,130	25.75	36.03	0.142	0.199	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

Kittiwake

- 2.4.8 For the Proposed Development alone, the combined impact of collision risk and displacement on kittiwake populations with connectivity to the Array Area exceeded a 0.02 percentage point decrease in survival for Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA (Table 2.4) using Option 2 of the sCRM. When using Option 1 of the sCRM, only Fowlsheugh SPA reached the 0.02 percentage point decrease in survival (Table 2.5). However, a PVA was also run for Buchan Ness to Collieston Coast SPA in order to provide a comparison using site-specific LiDAR data.
- 2.4.9 The in-combination mortalities were only collated for any SPAs which met the 0.2 Proposed Development alone mortality threshold (Table 2.4). As kittiwake were assessed for collision risk, consented and as-built mortalities were collated including and excluding Berwick Bank. For kittiwake, the 10 sites which met this threshold are:
- Buchan Ness to Collieston Coast SPA;
 - East Caithness Cliffs SPA;
 - Farne Islands SPA;
 - Flamborough and Filey Coast SPA;
 - Forth Islands SPA;
 - Fowlsheugh SPA;
 - North Caithness Cliffs SPA;
 - St Abb's Head to Fast Castle SPA;
 - Troup, Pennan and Lion's Head SPA; and
 - West Westray SPA.
- 2.4.10 The combined impact of collision risk and displacement on kittiwake populations with connectivity to the Array Area, in-combination with other OWFs exceeded the 0.02 percentage point threshold for all SPAs listed in Paragraph 2.4.9, using both as-built and consented collisions. Therefore, in-combination PVAs were conducted under the as-built and consented scenarios for 10 SPAs for kittiwake. The inclusion or exclusion of Berwick bank OWF did not alter which SPAs exceed the 0.02 percentage point decrease threshold for changes in survival rate (Table 2.4).

Table 2.4: Kittiwake Impact Rates Used in Population Viability Analysis (PVA) using Option 2 of the Stochastic Collision Risk Model and Worst Case Scenario

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
Buchan Ness to Collieston Coast	22,590	8.14	10.24	0.036	0.045	Yes
Calf of Eday	672	0.02	0.03	0.003	0.004	No
Copinsay	1,910	0.05	0.06	0.002	0.003	No
East Caithness Cliffs	48,958	2.07	2.60	0.004	0.005	No
Fair Isle	896	0.02	0.03	0.003	0.003	No
Farne Islands	8,804	0.56	0.70	0.006	0.008	No
Flamborough and Filey Coast	91,008	1.83	2.30	0.002	0.003	No
Forth Islands	9,084	0.94	1.19	0.010	0.013	No
Fowlsheugh	28,078	12.68	15.96	0.045	0.057	Yes
Hoy	532	0.02	0.02	0.003	0.004	No
Marwick Head	1,812	0.03	0.04	0.002	0.002	No
North Caithness Cliffs	11,142	0.40	0.50	0.004	0.004	No
Rousay	660	0.04	0.05	0.006	0.007	No
St Abb's Head to Fast Castle	10,300	0.89	1.11	0.009	0.011	No
Troup, Pennan and Lion's Heads	21,232	2.25	2.83	0.011	0.013	No
West Westray	5,510	0.27	0.34	0.005	0.006	No

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
In-combination including Berwick Bank (consented collisions)						
Buchan Ness to Collieston Coast	22,590	111.02	146.66	0.491	0.649	Yes
East Caithness Cliffs	48,958	293.48	435.05	0.599	0.889	Yes
Farne Islands	8,804	41.44	54.65	0.471	0.621	Yes
Flamborough and Filey Coast	91,008	566.78	633.50	0.623	0.696	Yes
Forth Islands	9,084	63.34	87.56	0.697	0.964	Yes
Fowlsheugh	28,078	206.94	271.56	0.737	0.967	Yes
North Caithness Cliffs	11,142	60.68	82.09	0.545	0.737	Yes
St Abb's Head to Fast Castle	10,300	264.54	336.67	2.568	3.269	Yes
Troup, Pennan and Lion's Heads	21,232	98.52	137.23	0.464	0.646	Yes
West Westray	5,510	49.65	70.85	0.901	1.286	Yes
In-combination excluding Berwick Bank (consented collisions)						
Buchan Ness to Collieston Coast	22,590	98.42	129.56	0.436	0.574	Yes
East Caithness Cliffs	48,958	269.79	400.96	0.551	0.819	Yes
Farne Islands	8,804	19.35	26.69	0.220	0.303	Yes
Flamborough and Filey Coast	91,008	544.66	601.69	0.598	0.661	Yes
Forth Islands	9,084	36.07	53.20	0.397	0.586	Yes
Fowlsheugh	28,078	124.71	167.95	0.444	0.598	Yes

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
North Caithness Cliffs	11,142	54.83	73.65	0.492	0.661	Yes
St Abb's Head to Fast Castle	10,300	29.38	42.85	0.285	0.416	Yes
Troup, Pennan and Lion's Heads	21,232	87.73	122.14	0.413	0.575	Yes
West Westray	5,510	42.70	60.83	0.775	1.104	Yes
In-combination including Berwick Bank (as-built collisions)						
Buchan Ness to Collieston Coast	22,590	107.59	143.22	0.476	0.634	Yes
East Caithness Cliffs	48,958	282.41	423.98	0.577	0.866	Yes
Farne Islands	8,804	40.49	53.71	0.460	0.610	Yes
Flamborough and Filey Coast	91,008	543.67	610.39	0.597	0.671	Yes
Forth Islands	9,084	62.49	86.71	0.688	0.955	Yes
Fowlsheugh	28,078	204.38	269.01	0.728	0.958	Yes
North Caithness Cliffs	11,142	57.90	79.31	0.520	0.712	Yes
St Abb's Head to Fast Castle	10,300	263.60	335.74	2.559	3.260	Yes
Troup, Pennan and Lion's Heads	21,232	94.44	133.14	0.445	0.627	Yes
West Westray	5,510	46.35	67.55	0.841	1.226	Yes
In-combination excluding Berwick Bank (as-built collisions)						
Buchan Ness to Collieston Coast	22,590	94.98	126.12	0.420	0.558	Yes
East Caithness Cliffs	48,958	258.72	389.89	0.528	0.796	Yes
Farne Islands	8,804	18.41	25.75	0.209	0.292	Yes

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Combined Collision Risk and Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Flamborough and Filey Coast	91,008	521.55	578.58	0.573	0.636	Yes
Forth Islands	9,084	35.22	52.36	0.388	0.576	Yes
Fowlsheugh	28,078	122.16	165.40	0.435	0.589	Yes
North Caithness Cliffs	11,142	52.05	70.87	0.467	0.636	Yes
St Abb's Head to Fast Castle	10,300	28.45	41.92	0.276	0.407	Yes
Troup, Pennan and Lion's Heads	21,232	83.65	118.06	0.394	0.556	Yes
West Westray	5,510	39.40	57.53	0.715	1.044	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

Table 2.5: Kittiwake Impact Rates Used in Population Viability Analysis (PVA) using Option 1 of the Stochastic Collision Risk Model and Most Likely Scenario

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
Buchan Ness to Collieston Coast	22,590	1.85	3.95	0.008	0.017	Yes³
Calf of Eday	672	0.00	0.01	0.001	0.001	No
Copinsay	1,910	0.01	0.02	0.001	0.001	No
East Caithness Cliffs	48,958	0.45	0.99	0.001	0.002	No
Fair Isle	896	0.00	0.01	0.001	0.001	No
Farne Islands	8,804	0.13	0.27	0.001	0.003	No

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Flamborough and Filey Coast	91,008	0.40	0.87	0.000	0.001	No
Forth Islands	9,084	0.21	0.46	0.002	0.005	No
Fowlsheugh	28,078	2.88	6.16	0.010	0.022	Yes
Hoy	532	0.00	0.01	0.001	0.001	No
Marwick Head	1,812	0.01	0.02	0.000	0.001	No
North Caithness Cliffs	11,142	0.09	0.19 ⁴	0.001	0.002	No
Rousay	660	0.01	0.02	0.001	0.003	No
St Abb's Head to Fast Castle	10,300	0.20	0.43	0.002	0.004	No
Troup, Pennan and Lion's Heads	21,232	0.50	1.09	0.002	0.005	No
West Westray	5,510	0.06	0.13 ⁴	0.001	0.002	No
In-combination including Berwick Bank (consented collisions)						
Buchan Ness to Collieston Coast	22,590	104.73	140.37	0.464	0.621	Yes
East Caithness Cliffs	48,958	291.86	433.44	0.596	0.885	Yes
Farne Islands	8,804	41.01	54.22	0.466	0.616	Yes
Flamborough and Filey Coast	91,008	565.35	632.07	0.621	0.695	Yes
Forth Islands	9,084	62.61	86.83	0.689	0.956	Yes
Fowlsheugh	28,078	197.14	261.76	0.702	0.932	Yes
North Caithness Cliffs	11,142	60.37	81.78	0.542	0.734	Yes
St Abb's Head to Fast Castle	10,300	263.85	335.99	2.562	3.262	Yes
Troup, Pennan and Lion's Heads	21,232	96.77	135.49	0.456	0.638	Yes

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
West Westray	5,510	49.44	70.64	0.897	1.282	Yes
In-combination excluding Berwick Bank (consented collisions)						
Buchan Ness to Collieston Coast	22,590	92.13	123.27	0.408	0.546	Yes
East Caithness Cliffs	48,958	268.17	399.35	0.548	0.816	Yes
Farne Islands	8,804	18.92	26.26	0.215	0.298	Yes
Flamborough and Filey Coast	91,008	543.23	600.26	0.597	0.660	Yes
Forth Islands	9,084	35.34	52.47	0.389	0.578	Yes
Fowlsheugh	28,078	114.91	158.15	0.409	0.563	Yes
North Caithness Cliffs	11,142	54.52	73.34	0.489	0.658	Yes
St Abb's Head to Fast Castle	10,300	28.69	42.17	0.279	0.409	Yes
Troup, Pennan and Lion's Heads	21,232	85.98	120.40	0.405	0.567	Yes
West Westray	5,510	42.49	60.62	0.771	1.100	Yes
In-combination including Berwick Bank (as-built collisions)						
Buchan Ness to Collieston Coast	22,590	101.30	136.93	0.448	0.606	Yes
East Caithness Cliffs	48,958	280.79	422.37	0.574	0.863	Yes
Farne Islands	8,804	40.06	53.28	0.455	0.605	Yes
Flamborough and Filey Coast	91,008	542.24	608.96	0.596	0.669	Yes
Forth Islands	9,084	61.76	85.98	0.680	0.947	Yes
Fowlsheugh	28,078	194.58	259.21	0.693	0.923	Yes
North Caithness Cliffs	11,142	57.59	79.00	0.517	0.709	Yes

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
St Abb's Head to Fast Castle	10,300	262.91	335.06	2.553	3.253	Yes
Troup, Pennan and Lion's Heads	21,232	92.69	131.40	0.437	0.619	Yes
West Westray	5,510	46.14	67.34	0.837	1.222	Yes
In-combination excluding Berwick Bank (as-built collisions)						
Buchan Ness to Collieston Coast	22,590	88.69	119.83	0.393	0.530	Yes
East Caithness Cliffs	48,958	257.10	388.28	0.525	0.793	Yes
Farne Islands	8,804	17.98	25.32	0.204	0.288	Yes
Flamborough and Filey Coast	91,008	520.12	577.15	0.572	0.634	Yes
Forth Islands	9,084	34.49	51.63	0.380	0.568	Yes
Fowlsheugh	28,078	112.36	155.60	0.400	0.554	Yes
North Caithness Cliffs	11,142	51.74	70.56	0.464	0.633	Yes
St Abb's Head to Fast Castle	10,300	27.76	41.24	0.270	0.400	Yes
Troup, Pennan and Lion's Heads	21,232	81.90	116.32	0.386	0.548	Yes
West Westray	5,510	39.19	57.32	0.711	1.040	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

³ Although the change in survival did not meet the 0.02 percentage point threshold required for PVA, a PVA has been run to provide a comparison to the PVA run using outputs from Option 2 of the sCRM.

⁴ Although the Proposed Development alone mortalities did not meet the 0.2 threshold for in-combination PVA, the SPA was taken forward in order to provide a comparison to the PVA run using outputs from Option 2 of the sCRM.

Great Black-backed Gull

- 2.4.11 Collision risk impacts from the Array Area did not exceed the 0.02 percentage point threshold for any SPA for great black-backed gull populations (Table 2.6). Therefore, no Proposed Development alone PVAs were conducted for this species.
- 2.4.12 As the Proposed Development alone mortalities did not exceed 0.2 for any of the SPAs with connectivity to the Array Area, no in-combination PVAs were required for great black-backed gull (Table 2.6).

Table 2.6: Great Black-backed Gull Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Collision Risk Mortalities	Decrease in Survival (Percentage Point Change)	Taken Forward for PVA
Proposed Development Alone				
Calf of Eday	116	0.01	0.009	No
Copinsay	134	0.01	0.006	No
East Caithness Cliffs	532	0.01	0.001	No

Herring Gull

- 2.4.13 For the Proposed Development alone, the impact of collision risk on herring gull populations with connectivity to the Array Area exceeded a 0.02 percentage point decrease in survival for Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA (Table 2.7). Therefore, two Proposed Development alone PVAs were conducted for this species.
- 2.4.14 The in-combination mortalities were only collated for any SPAs which met the 0.2 Proposed Development alone mortality threshold (Table 2.7). Although herring gull were assessed for collision risk, only consented mortalities were collated for herring gull as it was found only one project within Grant (2025) was impacted by as-built corrections. For herring gull, the two sites which met this threshold are:
- Buchan Ness to Collieston Coast SPA; and
 - Fowlsheugh SPA.
- 2.4.15 The impact of collision risk on herring gull populations with connectivity to the Array Area, in-combination with other OWFs exceeded the 0.02 percentage point threshold for all SPAs listed in Paragraph 2.4.14. Therefore, in-combination PVAs were conducted for two SPAs for herring gull. The inclusion or exclusion of Berwick Bank OWF did not alter which SPAs exceed the 0.02 percentage point decrease threshold for changes in survival rate (Table 2.7).

Table 2.7: Herring Gull Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Collision Risk Mortalities ¹	Decrease in Survival (Percentage Point Change) ²	Taken Forward for PVA
Proposed Development Alone				
Buchan Ness to Collieston Coast	4,154	2.98	0.072	Yes
Fowlsheugh	2,070	2.29	0.111	Yes
In-combination Including Berwick Bank (Consented Collisions)				
Buchan Ness to Collieston Coast	SPA not impacted by Berwick Bank, see ‘In-combination excluding Berwick Bank (consented collisions)’ for mortalities			
Fowlsheugh	2,070	6.36	0.307	Yes
In-combination Excluding Berwick Bank (Consented Collisions)				
Buchan Ness to Collieston Coast	4,154	7.94	0.191	Yes
Fowlsheugh	2,070	5.20	0.251	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

Arctic tern

2.4.16 Collision risk impacts from the Array Area did not exceed the 0.02 percentage point threshold for any SPA for Arctic tern populations (Table 2.8). Therefore, no Proposed Development alone PVAs were conducted for this species.

2.4.17 As the Proposed Development alone mortalities did not exceed 0.2 for any of the SPAs with connectivity to the Array Area, no in-combination PVAs were required for Arctic tern (Table 2.8).

Table 2.8: Arctic Tern Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Collision Risk Mortalities	Decrease in Survival (Percentage Point Change)	Taken Forward for PVA
Proposed Development Alone				
Auskerry	266	0.00	0.001	No
Coquet Island	2,480	0.00	0.000	No
Farne Island SPA	3,420	0.00	0.000	No
Papa Stour	124	0.00	0.002	No

Guillemot

- 2.4.18 For the Proposed Development alone, the impact of displacement on guillemot populations with connectivity to the Array Area exceeded a 0.02 percentage point decrease in survival for Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA (Table 2.9). Therefore, two Proposed Development alone PVAs were conducted for this species.
- 2.4.19 The in-combination mortalities were only collated for any SPAs which met the 0.2 Proposed Development alone mortality threshold (Table 2.9). For guillemot, the two sites which met this threshold are:
- Buchan Ness to Collieston Coast SPA; and
 - Fowlsheugh SPA.
- 2.4.20 The impact of displacement on guillemot populations with connectivity to the Array Area, in-combination with other OWFs exceeded the 0.02 percentage point threshold for all SPAs listed in Paragraph 2.4.19. Therefore, in-combination PVAs were conducted for two SPAs for guillemot. The inclusion or exclusion of Berwick Bank OWF did not alter which SPAs exceed the 0.02 percentage point decrease threshold for changes in survival rate (Table 2.9).

Table 2.9: Guillemot Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
Buchan Ness to Collieston Coast	39,440	39.83	83.82	0.101	0.213	Yes
Fowlsheugh	93,570	143.59	302.18	0.153	0.323	Yes
In-combination Including Berwick Bank						
Buchan Ness to Collieston Coast	39,440	210.29	483.86	0.533	1.227	Yes
Fowlsheugh	93,570	578.94	1,110.63	0.619	1.187	Yes
In-combination Excluding Berwick Bank						
Buchan Ness to Collieston Coast	39,440	200.70	462.41	0.509	1.172	Yes
Fowlsheugh	93,570	319.05	637.08	0.341	0.681	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

Razorbill

- 2.4.21 For the Proposed Development alone, the impact of displacement on razorbill populations with connectivity to the Array Area exceeded a 0.02 percentage point decrease in survival for Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA and Troup, Pennan and Lion's Heads SPA (Table 2.10). Therefore, four Proposed Development alone PVAs were conducted for this species.
- 2.4.22 The in-combination mortalities were only collated for any SPAs which met the 0.2 Proposed Development alone mortality threshold (Table 2.10). For razorbill, the six sites which met this threshold are:
- East Caithness Cliffs SPA;
 - Flamborough and Filey Coast SPA;
 - Forth Islands SPA;
 - Fowlsheugh SPA;
 - St Abb's Head to Fast Castle SPA; and
 - Troup, Pennan and Lion's Heads SPA.
- 2.4.23 The impact of displacement on razorbill populations with connectivity to the Array Area, in-combination with other OWFs exceeded the 0.02 percentage point threshold for all SPAs listed in Paragraph 2.4.22. Therefore, in-combination PVAs were conducted for six SPAs for razorbill. The inclusion or exclusion of Berwick Bank OWF did not alter which SPAs exceed the 0.02 percentage point decrease threshold for changes in survival rate (Table 2.10).

Table 2.10: Razorbill Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
East Caithness Cliffs	40,373	0.13	0.42	0.000	0.001	No
Flamborough and Filey Coast	37,476	0.10	0.33	0.000	0.001	No
Forth Islands	7,631	1.47	2.49	0.019	0.033	Yes
Fowlsheugh	18,844	12.18	20.36	0.065	0.108	Yes
Handa	10,997	0.00	0.02	0.000	0.000	No
Mingulay and Berneray	26,787	0.01	0.03	0.000	0.000	No
North Caithness Cliffs	4,796	0.02	0.06	0.000	0.001	No
Rathlin Island	30,044	0.01	0.03	0.000	0.000	No
St Abb's Head to Fast Castle	3,928	0.51	0.87	0.013	0.022	Yes
Troup, Pennan and Lion's Heads	6,054	0.82	1.39	0.014	0.023	Yes
In-combination Including Berwick Bank						
East Caithness Cliffs	40,373	155.77	310.70	0.386	0.770	Yes
Flamborough and Filey	37,476	193.25	368.14	0.516	0.982	Yes
Forth Islands	7,631	53.50	101.26	0.701	1.327	Yes
Fowlsheugh	18,844	91.69	168.64	0.487	0.895	Yes
St Abb's Head to Fast Castle	3,928	13.56	28.22	0.345	0.718	Yes
Troup, Pennan and Lion's Heads	6,054	16.10	34.26	0.266	0.566	Yes
In-combination Excluding Berwick Bank						
East Caithness Cliffs SPA	40,373	149.65	293.54	0.371	0.727	Yes
Flamborough and Filey SPA	37,476	189.08	355.61	0.505	0.949	Yes

SPA	Population Size (Burnell <i>et al.</i> , 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Forth Islands SPA	7,631	42.71	81.81	0.560	1.072	Yes
Fowlsheugh	18,844	78.72	145.06	0.418	0.770	Yes
St Abb's Head to Fast Castle	3,928	5.15	13.52	0.131	0.344	Yes
Troup, Pennan and Lion's Heads	6,054	14.57	30.74	0.241	0.508	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

Puffin

- 2.4.24 Displacement impacts from the Array Area did not exceed the 0.02 percentage point threshold for any SPA for puffin populations (Table 2.11). Therefore, no Proposed Development alone PVAs were conducted for this species.
- 2.4.25 The in-combination mortalities were only collated for any SPAs which met the 0.2 Proposed Development alone mortality threshold (Table 2.11). For puffin, the three SPAs which met this threshold are:
- Coquet Island SPA;
 - Farne Islands SPA; and
 - Forth Islands SPA.
- 2.4.26 The impact of displacement on puffin populations with connectivity to the Array Area, in-combination with other OWFs exceeded the 0.02 percentage point threshold for all SPAs listed in Paragraph 2.4.25. Therefore, in-combination PVAs were conducted for three SPAs for puffin. The inclusion or exclusion of Berwick Bank OWF did not alter which SPAs exceed the 0.02 percentage point decrease threshold for changes in survival rate (Table 2.11).

Table 2.11: Puffin Impact Rates Used in Population Viability Analysis (PVA)

SPA	Population Size (Burnell et al., 2023)	Displacement Mortalities ¹		Decrease in Survival (Percentage Point Change) ²		Taken Forward for PVA
		Low	High	Low	High	
Proposed Development Alone						
Coquet Island	50,058	0.36	0.56	0.001	0.001	No
Farne Islands	87,504	0.91	1.42	0.001	0.002	No
Forth Islands	85,846	1.58	2.48	0.002	0.003	No
Hoy	860	0.00	0.00	0.000	0.001	No
North Caithness Cliffs	6,078	0.02	0.03	0.000	0.001	No
In-combination Including Berwick Bank						
Coquet Island	50,058	15.98	25.40	0.032	0.051	Yes
Farne Islands	87,504	43.78	70.07	0.050	0.080	Yes
Forth Islands	85,846	187.43	305.43	0.218	0.356	Yes
In-combination Excluding Berwick Bank						
Coquet Island	50,058	12.38	19.40	0.025	0.039	Yes
Farne Islands	87,504	30.94	48.67	0.035	0.056	Yes
Forth Islands	85,846	169.31	275.23	0.197	0.321	Yes

¹ Mortalities which meet the 0.2 threshold required for in-combination assessment are highlighted in boldface.

² Changes in survival rates which meet the 0.02 percentage point threshold required for PVA are highlighted in boldface.

3 PVA Results

3.1.1 As described in Section 2.4, no PVAs were required for the Proposed Development alone or in-combination with other projects for fulmar, great black-backed gull and Arctic tern. Therefore, these species have not been presented within this section.

3.2 Gannet

Proposed Development Alone

3.2.1 Proposed Development alone PVAs were not conducted for gannet as no Proposed Development alone impacts exceeded a 0.02 percentage point decrease in survival (Table 2.3).

In-combination

3.2.2 The results of the PVA for combined collision and displacement impacts to gannet for the relevant SPA populations due to the Proposed Development in-combination with other projects are presented in Table 3.1 for the operational lifespan of the Proposed Development and Table 3.2 for a 50-year period. PVAs were run using both consented and as-built collision mortalities.

Table 3.1: Outputs for In-combination Population Viability Analysis of Combined Collision and Displacement Impacts for Gannet for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Consented Collisions						
Fair Isle	12,984	Included	Low	12,589	0.999 (0.998 to 1.000)	0.969 (0.923 to 1.018)
			High	12,241	0.998 (0.997 to 0.999)	0.942 (0.898 to 0.988)
		Excluded	Low	12,596	0.999 (0.998 to 1.000)	0.970 (0.924 to 1.020)
			High	12,284	0.998 (0.997 to 1.000)	0.945 (0.899 to 0.992)
Flamborough and Filey Coast	35,863	Included	Low	24,441	0.988 (0.987 to 0.989)	0.682 (0.660 to 0.705)
			High	19,585	0.981 (0.980 to 0.982)	0.546 (0.527 to 0.566)
		Excluded	Low	24,491	0.988 (0.987 to 0.989)	0.685 (0.663 to 0.707)
			High	19,689	0.981 (0.980 to 0.982)	0.549 (0.530 to 0.568)
Forth Islands	204,175	Included	Low	172,288	0.995 (0.994 to 0.995)	0.843 (0.831 to 0.855)
			High	159,692	0.992 (0.992 to 0.992)	0.782 (0.771 to 0.793)
		Excluded	Low	178,194	0.996 (0.995 to 0.996)	0.873 (0.860 to 0.884)
			High	167,889	0.994 (0.993 to 0.994)	0.822 (0.810 to 0.833)
Hermaness, Saxa Vord and Valla Field	76,839	Included	Low	74,691	0.999 (0.999 to 1.000)	0.973 (0.954 to 0.993)
			High	72,669	0.998 (0.998 to 0.999)	0.947 (0.929 to 0.965)
		Excluded	Low	74,813	0.999 (0.999 to 1.000)	0.974 (0.956 to 0.994)
			High	72,915	0.998 (0.998 to 0.999)	0.950 (0.931 to 0.968)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
North Rona and Sula Sgeir	32,831	Included	Low	32,599	1.000 (0.999 to 1.001)	0.993 (0.962 to 1.026)
			High	32,430	1.000 (0.999 to 1.000)	0.988 (0.957 to 1.020)
		Excluded	Low	32,673	1.000 (0.999 to 1.001)	0.994 (0.962 to 1.027)
			High	32,474	1.000 (0.999 to 1.000)	0.988 (0.957 to 1.021)
Noss	36,231	Included	Low	35,209	0.999 (0.998 to 1.000)	0.971 (0.943 to 1.000)
			High	34,219	0.998 (0.997 to 0.999)	0.944 (0.915 to 0.972)
		Excluded	Low	35,276	0.999 (0.998 to 1.000)	0.973 (0.944 to 1.001)
			High	34,291	0.998 (0.997 to 0.999)	0.946 (0.917 to 0.974)
Sule Skerry and Sule Stack	24,104	Included	Low	22,855	0.998 (0.997 to 0.999)	0.948 (0.913 to 0.985)
			High	22,359	0.998 (0.997 to 0.999)	0.928 (0.894 to 0.963)
		Excluded	Low	22,872	0.998 (0.997 to 0.999)	0.949 (0.915 to 0.985)
			High	22,353	0.998 (0.997 to 0.999)	0.930 (0.895 to 0.966)
As-built Collisions						
Fair Isle	12,984	Included	Low	12,602	0.999 (0.998 to 1.000)	0.970 (0.924 to 1.019)
			High	12,258	0.998 (0.997 to 0.999)	0.943 (0.898 to 0.990)
		Excluded	Low	12,623	0.999 (0.998 to 1.000)	0.972 (0.925 to 1.021)
			High	12,289	0.998 (0.997 to 1.000)	0.946 (0.902 to 0.994)
Flamborough and Filey Coast	35,863	Included	Low	25,767	0.989 (0.988 to 0.990)	0.718 (0.694 to 0.742)
			High	20,604	0.982 (0.981 to 0.983)	0.575 (0.555 to 0.595)
		Excluded	Low	25,792	0.989 (0.989 to 0.990)	0.720 (0.698 to 0.744)
			High	20,727	0.982 (0.981 to 0.983)	0.578 (0.557 to 0.597)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Forth Islands	204,175	Included	Low	172,516	0.995 (0.994 to 0.995)	0.845 (0.833 to 0.856)
			High	159,912	0.992 (0.992 to 0.993)	0.783 (0.772 to 0.794)
		Excluded	Low	178,504	0.996 (0.995 to 0.996)	0.874 (0.862 to 0.886)
			High	168,318	0.994 (0.993 to 0.994)	0.824 (0.812 to 0.835)
Hermaness, Saxa Vord and Valla Field	76,839	Included	Low	74,820	0.999 (0.999 to 1.000)	0.975 (0.956 to 0.995)
			High	72,778	0.998 (0.998 to 0.999)	0.949 (0.930 to 0.967)
		Excluded	Low	74,962	0.999 (0.999 to 1.000)	0.976 (0.957 to 0.996)
			High	73,014	0.998 (0.998 to 0.999)	0.951 (0.932 to 0.970)
North Rona and Sula Sgeir	32,831	Included	Low	32,694	1.000 (0.999 to 1.001)	0.994 (0.963 to 1.026)
			High	32,360	1.000 (0.999 to 1.000)	0.988 (0.957 to 1.020)
		Excluded	Low	32,645	1.000 (0.999 to 1.001)	0.994 (0.963 to 1.027)
			High	32,453	1.000 (0.999 to 1.000)	0.989 (0.958 to 1.021)
Noss	36,231	Included	Low	35,323	0.999 (0.998 to 1.000)	0.973 (0.944 to 1.003)
			High	34,301	0.998 (0.997 to 0.999)	0.945 (0.918 to 0.974)
		Excluded	Low	35,308	0.999 (0.998 to 1.000)	0.975 (0.946 to 1.003)
			High	34,320	0.998 (0.997 to 0.999)	0.948 (0.919 to 0.975)
Sule Skerry and Sule Stack	24,104	Included	Low	22,864	0.998 (0.997 to 0.999)	0.948 (0.913 to 0.984)
			High	22,399	0.998 (0.997 to 0.999)	0.929 (0.894 to 0.965)
		Excluded	Low	22,858	0.998 (0.997 to 0.999)	0.949 (0.914 to 0.985)
			High	22,413	0.998 (0.997 to 0.999)	0.930 (0.895 to 0.965)

Table 3.2: Outputs for In-combination Population Viability Analysis of Combined Collision and Displacement Impacts for Gannet for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Consented Collisions						
Fair Isle	14,661	Included	Low	13,921	0.999 (0.998 to 1.000)	0.950 (0.897 to 1.005)
			High	13,294	0.998 (0.997 to 0.999)	0.906 (0.852 to 0.960)
		Excluded	Low	13,985	0.999 (0.998 to 1.000)	0.952 (0.898 to 1.008)
			High	13,372	0.998 (0.997 to 0.999)	0.910 (0.860 to 0.965)
Flamborough and Filey Coast	40,498	Included	Low	21,517	0.988 (0.987 to 0.988)	0.532 (0.511 to 0.553)
			High	14,903	0.981 (0.980 to 0.981)	0.368 (0.353 to 0.384)
		Excluded	Low	21,630	0.988 (0.987 to 0.988)	0.535 (0.513 to 0.556)
			High	15,018	0.981 (0.980 to 0.981)	0.371 (0.355 to 0.387)
Forth Islands	232,618	Included	Low	175,444	0.994 (0.994 to 0.995)	0.755 (0.742 to 0.767)
			High	154,930	0.992 (0.992 to 0.992)	0.666 (0.655 to 0.677)
		Excluded	Low	185,861	0.996 (0.995 to 0.996)	0.798 (0.785 to 0.811)
			High	168,157	0.994 (0.993 to 0.994)	0.724 (0.712 to 0.735)
Hermaness, Saxa Vord and Valla Field	86,591	Included	Low	82,810	0.999 (0.999 to 1.000)	0.956 (0.934 to 0.979)
			High	79,209	0.998 (0.998 to 0.999)	0.914 (0.893 to 0.936)
		Excluded	Low	82,779	0.999 (0.999 to 1.000)	0.958 (0.937 to 0.981)
			High	79,505	0.998 (0.998 to 0.999)	0.918 (0.896 to 0.940)
North Rona and Sula Sgeir	37,061	Included	Low	36,700	1.000 (0.999 to 1.000)	0.989 (0.954 to 1.027)
			High	36,315	1.000 (0.999 to 1.000)	0.979 (0.944 to 1.017)
		Excluded	Low	36,634	1.000 (0.999 to 1.000)	0.990 (0.953 to 1.027)
			High	36,351	1.000 (0.999 to 1.000)	0.981 (0.945 to 1.019)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Noss	40,747	Included	Low	38,853	0.999 (0.998 to 1.000)	0.953 (0.920 to 0.986)
			High	36,998	0.998 (0.997 to 0.999)	0.909 (0.876 to 0.941)
		Excluded	Low	38,921	0.999 (0.999 to 1.000)	0.955 (0.923 to 0.987)
			High	37,230	0.998 (0.998 to 0.999)	0.912 (0.880 to 0.944)
Sule Skerry and Sule Stack	27,206	Included	Low	24,964	0.998 (0.998 to 0.999)	0.916 (0.877 to 0.959)
			High	24,129	0.998 (0.997 to 0.998)	0.884 (0.847 to 0.924)
		Excluded	Low	25,048	0.998 (0.998 to 0.999)	0.918 (0.879 to 0.959)
			High	24,194	0.998 (0.997 to 0.998)	0.887 (0.848 to 0.926)
As-built Collisions						
Fair Isle	14,661	Included	Low	13,955	0.999 (0.998 to 1.000)	0.952 (0.899 to 1.009)
			High	13,294	0.998 (0.997 to 0.999)	0.908 (0.857 to 0.963)
		Excluded	Low	14,003	0.999 (0.998 to 1.000)	0.954 (0.900 to 1.011)
			High	13,413	0.998 (0.997 to 0.999)	0.913 (0.861 to 0.968)
Flamborough and Filey Coast	40,498	Included	Low	23,367	0.989 (0.989 to 0.990)	0.579 (0.557 to 0.602)
			High	16,208	0.982 (0.982 to 0.983)	0.401 (0.385 to 0.418)
		Excluded	Low	23,550	0.989 (0.989 to 0.990)	0.582 (0.560 to 0.605)
			High	16,310	0.982 (0.982 to 0.983)	0.404 (0.387 to 0.421)
Forth Islands	232,618	Included	Low	176,147	0.995 (0.994 to 0.995)	0.757 (0.744 to 0.769)
			High	155,396	0.992 (0.992 to 0.992)	0.668 (0.657 to 0.680)
		Excluded	Low	186,120	0.996 (0.995 to 0.996)	0.801 (0.788 to 0.814)
			High	169,012	0.994 (0.993 to 0.994)	0.726 (0.714 to 0.738)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Hermaness, Saxa Vord and Valla Field	86,591	Included	Low	82,917	0.999 (0.999 to 1.000)	0.959 (0.937 to 0.982)
			High	79,248	0.998 (0.998 to 0.999)	0.916 (0.895 to 0.938)
		Excluded	Low	83,097	0.999 (0.999 to 1.000)	0.961 (0.939 to 0.984)
			High	79,635	0.998 (0.998 to 0.999)	0.921 (0.899 to 0.943)
North Rona and Sula Sgeir	37,061	Included	Low	36,781	1.000 (0.999 to 1.000)	0.990 (0.954 to 1.027)
			High	36,351	1.000 (0.999 to 1.000)	0.980 (0.944 to 1.017)
		Excluded	Low	36,720	1.000 (0.999 to 1.000)	0.990 (0.955 to 1.027)
			High	36,393	1.000 (0.999 to 1.000)	0.982 (0.945 to 1.019)
Noss	40,747	Included	Low	38,947	0.999 (0.998 to 1.000)	0.956 (0.922 to 0.990)
			High	37,156	0.998 (0.998 to 0.999)	0.911 (0.880 to 0.943)
		Excluded	Low	39,029	0.999 (0.999 to 1.000)	0.958 (0.925 to 0.991)
			High	37,270	0.998 (0.998 to 0.999)	0.916 (0.884 to 0.947)
Sule Skerry and Sule Stack	27,206	Included	Low	25,011	0.998 (0.998 to 0.999)	0.916 (0.876 to 0.957)
			High	24,092	0.998 (0.997 to 0.998)	0.885 (0.846 to 0.927)
		Excluded	Low	25,054	0.998 (0.998 to 0.999)	0.918 (0.877 to 0.959)
			High	24,200	0.998 (0.997 to 0.998)	0.888 (0.849 to 0.927)

3.3 Kittiwake

Proposed Development Alone

- 3.3.1 The results of the PVA for combined collision and displacement impacts to kittiwake for the relevant SPA populations due to the Proposed Development alone are presented in Table 3.3 for the operational lifespan of the Proposed Development and Table 3.4 for a 50-year period. PVAs were run using both consented and as-built collision mortalities.

Table 3.3: Outputs for Proposed Development Alone Population Viability Analysis of Combined Collision and Displacement Impacts for Kittiwake for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Option 1 sCRM					
Buchan Ness to Collieston Coast	40,809	Low	40,685	1.000 (0.999 to 1.001)	0.996 (0.959 to 1.036)
		High	40,628	1.000 (0.999 to 1.001)	0.993 (0.956 to 1.031)
Fowlsheugh	51,919	Low	51,754	1.000 (0.999 to 1.001)	0.996 (0.963 to 1.030)
		High	51,468	1.000 (0.999 to 1.001)	0.992 (0.958 to 1.027)
Option 2 sCRM					
Buchan Ness to Collieston Coast	40,809	Low	40,278	1.000 (0.999 to 1.001)	0.986 (0.951 to 1.024)
		High	40,145	0.999 (0.998 to 1.000)	0.983 (0.946 to 1.023)
Fowlsheugh	51,919	Low	51,040	0.999 (0.999 to 1.000)	0.984 (0.950 to 1.016)
		High	50,968	0.999 (0.998 to 1.000)	0.980 (0.946 to 1.012)

Table 3.4: Outputs for Proposed Development Alone Population Viability Analysis of Combined Collision and Displacement Impacts for Kittiwake for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Option 1 sCRM					
Buchan Ness to Collieston Coast	52,373	Low	53,167	1.000 (0.999 to 1.001)	0.995 (0.953 to 1.037)
		High	52,708	1.000 (0.999 to 1.001)	0.990 (0.947 to 1.033)
Fowlsheugh	66,925	Low	66,439	1.000 (0.999 to 1.001)	0.994 (0.955 to 1.031)
		High	66,078	1.000 (0.999 to 1.000)	0.987 (0.948 to 1.026)
Option 2 sCRM					
Buchan Ness to Collieston Coast	52,373	Low	52,211	1.000 (0.999 to 1.000)	0.978 (0.937 to 1.022)
		High	51,969	0.999 (0.999 to 1.000)	0.973 (0.932 to 1.018)
Fowlsheugh	66,925	Low	65,007	0.999 (0.999 to 1.000)	0.973 (0.936 to 1.011)
		High	64,757	0.999 (0.999 to 1.000)	0.966 (0.928 to 1.003)

In-combination

- 3.3.2 The results of the PVA for combined collision and displacement impacts to kittiwake for the relevant SPA populations due to the Proposed Development in-combination with other projects are presented in Table 3.5 for the operational lifespan of the Proposed Development and Table 3.6 for a 50-year period. PVAs were run using both consented and as-built collision mortalities.

Table 3.5: Outputs for In-combination Population Viability Analysis of Combined Collision and Displacement Impacts for Kittiwake for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Option 1 sCRM: Consented Collisions						
Buchan Ness to Collieston Coast	40,809	Included	Low	34,464	0.995 (0.993 to 0.995)	0.843 (0.811 to 0.875)
			High	32,405	0.993 (0.992 to 0.994)	0.795 (0.764 to 0.827)
		Excluded	Low	35,148	0.995 (0.994 to 0.996)	0.860 (0.827 to 0.894)
			High	33,250	0.994 (0.992 to 0.995)	0.818 (0.786 to 0.849)
East Caithness Cliffs	92,591	Included	Low	74,368	0.993 (0.992 to 0.994)	0.803 (0.780 to 0.826)
			High	66,858	0.990 (0.989 to 0.990)	0.721 (0.700 to 0.742)
		Excluded	Low	75,444	0.994 (0.993 to 0.994)	0.817 (0.795 to 0.840)
			High	68,618	0.990 (0.990 to 0.991)	0.740 (0.719 to 0.761)
Farne Islands	15,960	Included	Low	13,403	0.994 (0.993 to 0.996)	0.843 (0.792 to 0.897)
			High	12,679	0.993 (0.991 to 0.994)	0.797 (0.750 to 0.848)
		Excluded	Low	14,710	0.997 (0.996 to 0.999)	0.924 (0.868 to 0.983)
			High	14,250	0.996 (0.995 to 0.998)	0.896 (0.842 to 0.955)
Flamborough and Filey Coast	168,033	Included	Low	133,367	0.993 (0.992 to 0.993)	0.796 (0.779 to 0.812)
			High	129,905	0.992 (0.991 to 0.992)	0.774 (0.758 to 0.790)
		Excluded	Low	134,680	0.993 (0.992 to 0.993)	0.803 (0.787 to 0.819)
			High	131,686	0.992 (0.992 to 0.993)	0.784 (0.768 to 0.800)
Forth Islands	15,856	Included	Low	12,284	0.992 (0.990 to 0.993)	0.776 (0.730 to 0.821)
			High	11,118	0.989 (0.987 to 0.990)	0.702 (0.659 to 0.746)
		Excluded	Low	13,743	0.995 (0.994 to 0.997)	0.866 (0.817 to 0.919)
			High	12,804	0.993 (0.991 to 0.995)	0.808 (0.761 to 0.857)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Fowlsheugh	51,919	Included	Low	40,050	0.992 (0.991 to 0.993)	0.772 (0.744 to 0.799)
			High	36,761	0.989 (0.988 to 0.990)	0.709 (0.684 to 0.734)
		Excluded	Low	44,667	0.995 (0.994 to 0.996)	0.860 (0.829 to 0.889)
			High	42,188	0.993 (0.992 to 0.994)	0.813 (0.784 to 0.840)
North Caithness Cliffs	20,838	Included	Low	17,139	0.994 (0.992 to 0.995)	0.819 (0.774 to 0.866)
			High	15,935	0.991 (0.990 to 0.993)	0.763 (0.719 to 0.807)
		Excluded	Low	17,425	0.994 (0.993 to 0.996)	0.835 (0.791 to 0.884)
			High	16,387	0.992 (0.991 to 0.994)	0.784 (0.740 to 0.830)
St Abb's Head to Fast Castle	17,963	Included	Low	6,910	0.970 (0.968 to 0.971)	0.385 (0.359 to 0.411)
			High	5,293	0.961 (0.959 to 0.963)	0.295 (0.273 to 0.315)
		Excluded	Low	16,225	0.997 (0.995 to 0.998)	0.903 (0.854 to 0.954)
			High	15,443	0.995 (0.994 to 0.997)	0.861 (0.814 to 0.910)
Troup, Pennan and Lion's Heads	39,262	Included	Low	33,069	0.995 (0.994 to 0.996)	0.846 (0.811 to 0.881)
			High	31,006	0.992 (0.991 to 0.993)	0.790 (0.758 to 0.822)
		Excluded	Low	33,798	0.995 (0.994 to 0.996)	0.862 (0.826 to 0.897)
			High	31,792	0.993 (0.992 to 0.994)	0.812 (0.779 to 0.846)
West Westray	10,173	Included	Low	7,306	0.989 (0.987 to 0.991)	0.718 (0.664 to 0.780)
			High	6,318	0.985 (0.983 to 0.987)	0.622 (0.572 to 0.675)
		Excluded	Low	7,630	0.991 (0.989 to 0.993)	0.752 (0.692 to 0.814)
			High	6,750	0.987 (0.985 to 0.989)	0.666 (0.613 to 0.722)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Option 1 sCRM: 'As-built' Collisions						
Buchan Ness to Collieston Coast	40,809	Included	Low	34,563	0.995 (0.994 to 0.996)	
			High	32,716	0.993 (0.992 to 0.994)	
		Excluded	Low	35,412	0.995 (0.994 to 0.996)	
			High	33,534	0.994 (0.993 to 0.995)	
East Caithness Cliffs	92,591	Included	Low	75,025	0.993 (0.992 to 0.994)	
			High	67,339	0.990 (0.989 to 0.991)	
		Excluded	Low	76,314	0.994 (0.993 to 0.994)	
			High	69,197	0.991 (0.990 to 0.991)	
Farne Islands	15,960	Included	Low	13,475	0.995 (0.993 to 0.996)	
			High	12,711	0.993 (0.991 to 0.994)	
		Excluded	Low	14,768	0.998 (0.996 to 0.999)	
			High	14,264	0.997 (0.995 to 0.998)	
Flamborough and Filey Coast	168,033	Included	Low	134,865	0.993 (0.992 to 0.993)	
			High	131,152	0.992 (0.991 to 0.993)	
		Excluded	Low	136,133	0.993 (0.993 to 0.994)	
			High	132,606	0.992 (0.992 to 0.993)	
Forth Islands	15,856	Included	Low	12,297	0.992 (0.990 to 0.994)	
			High	11,181	0.989 (0.987 to 0.990)	
		Excluded	Low	13,825	0.995 (0.994 to 0.997)	
			High	12,892	0.993 (0.992 to 0.995)	
Fowlsheugh	51,919	Included	Low	40,285	0.992 (0.991 to 0.993)	
			High	36,881	0.989 (0.988 to 0.990)	

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
		Excluded	Low	44,805	0.995 (0.994 to 0.996)	0.863 (0.832 to 0.893)
			High	42,302	0.993 (0.992 to 0.994)	0.815 (0.787 to 0.844)
North Caithness Cliffs	20,838	Included	Low	17,213	0.994 (0.992 to 0.995)	0.827 (0.781 to 0.873)
			High	16,067	0.992 (0.990 to 0.993)	0.770 (0.727 to 0.815)
		Excluded	Low	17,647	0.995 (0.993 to 0.996)	0.843 (0.796 to 0.891)
			High	16,510	0.993 (0.991 to 0.994)	0.792 (0.748 to 0.837)
St Abb's Head to Fast Castle	17,963	Included	Low	6,941	0.970 (0.968 to 0.971)	0.386 (0.361 to 0.411)
			High	5,320	0.961 (0.959 to 0.963)	0.296 (0.274 to 0.316)
		Excluded	Low	16,239	0.997 (0.995 to 0.998)	0.906 (0.856 to 0.959)
			High	15,470	0.995 (0.994 to 0.997)	0.863 (0.816 to 0.913)
Troup, Pennan and Lion's Heads	39,262	Included	Low	33,324	0.995 (0.994 to 0.996)	0.852 (0.818 to 0.887)
			High	31,141	0.993 (0.992 to 0.994)	0.796 (0.764 to 0.828)
		Excluded	Low	34,031	0.995 (0.994 to 0.997)	0.868 (0.833 to 0.904)
			High	32,054	0.994 (0.992 to 0.995)	0.818 (0.786 to 0.851)
West Westray	10,173	Included	Low	7,445	0.990 (0.988 to 0.992)	0.734 (0.678 to 0.793)
			High	6,494	0.986 (0.983 to 0.988)	0.636 (0.587 to 0.690)
		Excluded	Low	7,811	0.992 (0.989 to 0.994)	0.769 (0.708 to 0.833)
			High	6,916	0.988 (0.986 to 0.990)	0.682 (0.627 to 0.738)
Option 2 sCRM: Consented Collisions						
Buchan Ness to Collieston Coast	40,809	Included	Low	34,051	0.994 (0.993 to 0.995)	0.835 (0.802 to 0.867)
			High	32,163	0.992 (0.991 to 0.993)	0.787 (0.756 to 0.818)
		Excluded	Low	34,770	0.995 (0.994 to 0.996)	0.851 (0.820 to 0.885)
			High	33,168	0.993 (0.992 to 0.994)	0.809 (0.779 to 0.842)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
East Caithness Cliffs	92,591	Included	Low	74,159	0.993 (0.992 to 0.994)	0.802 (0.780 to 0.824)
			High	66,903	0.989 (0.989 to 0.990)	0.721 (0.699 to 0.740)
		Excluded	Low	75,495	0.993 (0.993 to 0.994)	0.816 (0.794 to 0.839)
			High	68,458	0.990 (0.990 to 0.991)	0.739 (0.719 to 0.760)
Farne Islands	15,960	Included	Low	13,399	0.994 (0.993 to 0.996)	0.841 (0.790 to 0.894)
			High	12,644	0.993 (0.991 to 0.994)	0.795 (0.747 to 0.847)
		Excluded	Low	14,683	0.997 (0.996 to 0.999)	0.923 (0.868 to 0.979)
			High	14,235	0.996 (0.995 to 0.998)	0.894 (0.842 to 0.950)
Flamborough and Filey Coast	168,033	Included	Low	133,607	0.993 (0.992 to 0.993)	0.795 (0.779 to 0.811)
			High	129,981	0.992 (0.991 to 0.992)	0.774 (0.758 to 0.789)
		Excluded	Low	134,714	0.993 (0.992 to 0.993)	0.802 (0.786 to 0.818)
			High	131,417	0.992 (0.992 to 0.993)	0.784 (0.768 to 0.800)
Forth Islands	15,856	Included	Low	12,271	0.992 (0.990 to 0.993)	0.773 (0.727 to 0.820)
			High	11,103	0.989 (0.987 to 0.990)	0.700 (0.657 to 0.744)
		Excluded	Low	13,718	0.995 (0.994 to 0.997)	0.864 (0.813 to 0.915)
			High	12,781	0.993 (0.991 to 0.995)	0.805 (0.758 to 0.855)
Fowlsheugh	51,919	Included	Low	39,538	0.991 (0.990 to 0.992)	0.762 (0.735 to 0.788)
			High	36,319	0.989 (0.988 to 0.989)	0.700 (0.674 to 0.725)
		Excluded	Low	44,034	0.995 (0.994 to 0.996)	0.849 (0.820 to 0.878)
			High	41,539	0.993 (0.992 to 0.994)	0.802 (0.774 to 0.830)
North Caithness Cliffs	20,838	Included	Low	17,056	0.994 (0.992 to 0.995)	0.819 (0.774 to 0.865)
			High	15,952	0.991 (0.990 to 0.993)	0.763 (0.720 to 0.807)
		Excluded	Low	17,448	0.994 (0.993 to 0.996)	0.835 (0.790 to 0.881)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
St Abb's Head to Fast Castle	17,963	Included	High	16,405	0.992 (0.991 to 0.994)	0.784 (0.739 to 0.829)
			Low	6,885	0.970 (0.968 to 0.971)	0.384 (0.358 to 0.410)
		Excluded	High	5,270	0.961 (0.959 to 0.963)	0.294 (0.273 to 0.315)
			Low	16,200	0.997 (0.995 to 0.998)	0.900 (0.852 to 0.952)
Troup, Pennan and Lion's Heads	39,262	Included	High	15,387	0.995 (0.993 to 0.997)	0.859 (0.810 to 0.907)
			Low	32,962	0.995 (0.993 to 0.996)	0.843 (0.810 to 0.877)
		Excluded	High	30,894	0.992 (0.991 to 0.993)	0.788 (0.756 to 0.821)
			Low	33,736	0.995 (0.994 to 0.996)	0.859 (0.825 to 0.893)
West Westray	10,173	Included	High	31,664	0.993 (0.992 to 0.994)	0.809 (0.776 to 0.842)
			Low	7,327	0.989 (0.987 to 0.991)	0.718 (0.662 to 0.778)
		Excluded	High	6,347	0.985 (0.983 to 0.987)	0.621 (0.572 to 0.672)
			Low	7,653	0.991 (0.989 to 0.993)	0.751 (0.694 to 0.812)
Option 2 sCRM: As-built Collisions						
Buchan Ness to Collieston Coast	40,809	Included	High	32,350	0.992 (0.991 to 0.993)	0.791 (0.761 to 0.822)
			Low	34,247	0.994 (0.993 to 0.995)	0.839 (0.807 to 0.872)
		Excluded	High	33,299	0.993 (0.992 to 0.994)	0.814 (0.783 to 0.845)
			Low	34,915	0.995 (0.994 to 0.996)	0.856 (0.824 to 0.891)
East Caithness Cliffs	92,591	Included	High	67,210	0.990 (0.989 to 0.990)	0.726 (0.706 to 0.747)
			Low	75,004	0.993 (0.992 to 0.994)	0.808 (0.786 to 0.831)
		Excluded	High	69,126	0.991 (0.990 to 0.991)	0.746 (0.724 to 0.766)
			Low	76,248	0.994 (0.993 to 0.994)	0.823 (0.801 to 0.846)
Farne Islands	15,960	Included	Low	13,432	0.995 (0.993 to 0.996)	0.844 (0.793 to 0.897)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
			High	12,714	0.993 (0.991 to 0.994)	0.798 (0.750 to 0.850)
			Excluded	Low	14,724	0.998 (0.996 to 0.999)
			High	14,265	0.997 (0.995 to 0.998)	0.898 (0.844 to 0.958)
			Flamborough and Filey Coast	Included	Low	134,874
High	131,155	0.992 (0.991 to 0.993)			0.781 (0.765 to 0.797)	
Excluded	Low	135,982		0.993 (0.993 to 0.994)	0.810 (0.794 to 0.826)	
	High	132,619		0.992 (0.992 to 0.993)	0.791 (0.775 to 0.806)	
Forth Islands	15,856	Included	Low	12,336	0.992 (0.990 to 0.993)	0.776 (0.730 to 0.823)
			High	11,152	0.989 (0.987 to 0.990)	0.703 (0.660 to 0.746)
		Excluded	Low	13,731	0.995 (0.994 to 0.997)	0.867 (0.817 to 0.920)
			High	12,819	0.993 (0.991 to 0.995)	0.809 (0.760 to 0.858)
Fowlsheugh	51,919	Included	Low	39,711	0.991 (0.990 to 0.992)	0.765 (0.737 to 0.792)
			High	36,446	0.989 (0.988 to 0.990)	0.702 (0.676 to 0.727)
		Excluded	Low	44,233	0.995 (0.994 to 0.996)	0.852 (0.823 to 0.882)
			High	41,659	0.993 (0.992 to 0.994)	0.805 (0.777 to 0.833)
North Caithness Cliffs	20,838	Included	Low	17,266	0.994 (0.992 to 0.995)	0.826 (0.780 to 0.873)
			High	16,061	0.992 (0.990 to 0.993)	0.769 (0.727 to 0.812)
		Excluded	Low	17,606	0.994 (0.993 to 0.996)	0.842 (0.796 to 0.890)
			High	16,525	0.992 (0.991 to 0.994)	0.791 (0.748 to 0.836)
St Abb's Head to Fast Castle	17,963	Included	Low	6,920	0.970 (0.968 to 0.971)	0.385 (0.360 to 0.410)
			High	5,305	0.961 (0.959 to 0.963)	0.295 (0.274 to 0.316)
		Excluded	Low	16,255	0.997 (0.995 to 0.998)	0.903 (0.853 to 0.954)
			High	15,430	0.995 (0.994 to 0.997)	0.861 (0.813 to 0.911)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Troup, Pennan and Lion's Heads	39,262	Included	Low	33,213	0.995 (0.994 to 0.996)	0.849 (0.815 to 0.883)
			High	31,175	0.993 (0.991 to 0.994)	0.794 (0.761 to 0.826)
		Excluded	Low	33,932	0.995 (0.994 to 0.996)	0.866 (0.830 to 0.901)
			High	31,871	0.993 (0.992 to 0.995)	0.815 (0.782 to 0.849)
West Westray	10,173	Included	Low	7,435	0.990 (0.988 to 0.992)	0.733 (0.676 to 0.794)
			High	6,468	0.985 (0.983 to 0.988)	0.635 (0.584 to 0.689)
		Excluded	Low	7,787	0.992 (0.989 to 0.994)	0.768 (0.707 to 0.830)
			High	6,930	0.988 (0.985 to 0.990)	0.679 (0.627 to 0.736)

Table 3.6: Outputs for In-combination Population Viability Analysis of Combined Collision and Displacement Impacts for Kittiwake for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Option 1 and MLS: Consented Collisions						
Buchan Ness to Collieston Coast	53,373	Included	Low	40,324	0.995 (0.994 to 0.995)	0.755 (0.722 to 0.788)
			High	36,670	0.993 (0.992 to 0.993)	0.686 (0.655 to 0.717)
		Excluded	Low	41,750	0.995 (0.994 to 0.996)	0.781 (0.747 to 0.816)
			High	38,457	0.994 (0.993 to 0.994)	0.719 (0.686 to 0.750)
East Caithness Cliffs	121,395	Included	Low	84,664	0.993 (0.992 to 0.993)	0.697 (0.674 to 0.719)
			High	70,948	0.990 (0.989 to 0.990)	0.584 (0.565 to 0.603)
		Excluded	Low	86,982	0.994 (0.993 to 0.994)	0.718 (0.695 to 0.740)
			High	74,098	0.990 (0.990 to 0.991)	0.610 (0.590 to 0.629)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Farne Islands	20,799	Included	Low	15,681	0.994 (0.993 to 0.996)	0.754 (0.701 to 0.812)
			High	14,357	0.993 (0.991 to 0.994)	0.688 (0.641 to 0.740)
		Excluded	Low	18,258	0.997 (0.996 to 0.999)	0.878 (0.817 to 0.943)
			High	17,448	0.996 (0.995 to 0.998)	0.835 (0.778 to 0.899)
Flamborough and Filey Coast	220,108	Included	Low	150,937	0.993 (0.992 to 0.993)	0.686 (0.670 to 0.702)
			High	144,602	0.992 (0.991 to 0.992)	0.656 (0.641 to 0.671)
		Excluded	Low	153,224	0.993 (0.993 to 0.993)	0.696 (0.680 to 0.712)
			High	147,461	0.992 (0.992 to 0.993)	0.670 (0.654 to 0.686)
Forth Islands	20,539	Included	Low	13,501	0.992 (0.991 to 0.993)	0.658 (0.612 to 0.705)
			High	11,502	0.989 (0.987 to 0.990)	0.559 (0.519 to 0.600)
		Excluded	Low	16,250	0.995 (0.994 to 0.997)	0.790 (0.736 to 0.846)
			High	14,473	0.993 (0.992 to 0.994)	0.704 (0.657 to 0.754)
Fowlsheugh	66,925	Included	Low	43,729	0.992 (0.991 to 0.992)	0.653 (0.625 to 0.679)
			High	37,919	0.989 (0.988 to 0.990)	0.567 (0.543 to 0.591)
		Excluded	Low	52,280	0.995 (0.994 to 0.996)	0.780 (0.749 to 0.811)
			High	47,578	0.993 (0.993 to 0.994)	0.711 (0.681 to 0.739)
North Caithness Cliffs	27,221	Included	Low	19,593	0.994 (0.992 to 0.995)	0.721 (0.675 to 0.768)
			High	17,479	0.991 (0.990 to 0.992)	0.641 (0.598 to 0.684)
		Excluded	Low	20,282	0.994 (0.993 to 0.995)	0.743 (0.696 to 0.793)
			High	18,262	0.992 (0.991 to 0.993)	0.670 (0.627 to 0.716)
St Abb's Head to Fast Castle	23,346	Included	Low	4,848	0.970 (0.968 to 0.971)	0.208 (0.190 to 0.225)
			High	3,128	0.961 (0.959 to 0.963)	0.134 (0.121 to 0.147)
		Excluded	Low	19,659	0.997 (0.996 to 0.998)	0.845 (0.793 to 0.901)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Troup, Pennan and Lion's Heads	51,457	Included	High	18,162	0.995 (0.994 to 0.996)	0.781 (0.731 to 0.832)
			Low	38,879	0.995 (0.994 to 0.995)	0.759 (0.723 to 0.795)
		Excluded	High	34,807	0.992 (0.992 to 0.993)	0.679 (0.646 to 0.711)
			Low	40,142	0.995 (0.994 to 0.996)	0.783 (0.745 to 0.820)
West Westray	13,320	Included	High	36,357	0.993 (0.992 to 0.994)	0.709 (0.676 to 0.744)
			Low	7,711	0.989 (0.988 to 0.991)	0.579 (0.528 to 0.638)
		Excluded	High	6,077	0.985 (0.983 to 0.986)	0.457 (0.415 to 0.506)
			Low	8,358	0.991 (0.989 to 0.992)	0.626 (0.568 to 0.688)
Option 1 and MLS: As-built Collisions						
Buchan Ness to Collieston Coast	53,373	Included	High	38,723	0.994 (0.993 to 0.994)	0.725 (0.691 to 0.757)
			Low	42,179	0.995 (0.995 to 0.996)	0.788 (0.753 to 0.824)
		Excluded	High	36,994	0.993 (0.992 to 0.994)	0.692 (0.661 to 0.723)
			Low	40,778	0.995 (0.994 to 0.995)	0.762 (0.728 to 0.797)
East Caithness Cliffs	121,395	Included	High	71,958	0.990 (0.989 to 0.990)	0.592 (0.571 to 0.611)
			Low	86,027	0.993 (0.993 to 0.994)	0.706 (0.683 to 0.729)
		Excluded	High	75,251	0.991 (0.990 to 0.991)	0.618 (0.597 to 0.639)
			Low	88,411	0.994 (0.993 to 0.994)	0.727 (0.704 to 0.750)
Farne Islands	20,799	Included	High	14,419	0.993 (0.992 to 0.994)	0.693 (0.644 to 0.746)
			Low	15,821	0.995 (0.993 to 0.996)	0.759 (0.705 to 0.815)
		Excluded	High	17,447	0.997 (0.995 to 0.998)	0.840 (0.782 to 0.900)
			Low	18,439	0.998 (0.996 to 0.999)	0.884 (0.825 to 0.949)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Flamborough and Filey Coast	220,108	Included	Low	153,480	0.993 (0.993 to 0.993)	0.697 (0.681 to 0.713)
			High	146,501	0.992 (0.992 to 0.992)	0.667 (0.651 to 0.682)
		Excluded	Low	155,607	0.993 (0.993 to 0.994)	0.707 (0.691 to 0.724)
			High	149,811	0.992 (0.992 to 0.993)	0.681 (0.665 to 0.697)
Forth Islands	20,539	Included	Low	13,587	0.992 (0.991 to 0.993)	0.662 (0.616 to 0.709)
			High	11,581	0.989 (0.988 to 0.990)	0.563 (0.523 to 0.604)
		Excluded	Low	16,293	0.995 (0.994 to 0.997)	0.794 (0.742 to 0.851)
			High	14,561	0.993 (0.992 to 0.994)	0.709 (0.658 to 0.760)
Fowlsheugh	66,925	Included	Low	43,923	0.992 (0.991 to 0.992)	0.657 (0.629 to 0.683)
			High	38,162	0.989 (0.988 to 0.990)	0.571 (0.546 to 0.594)
		Excluded	Low	52,525	0.995 (0.995 to 0.996)	0.785 (0.753 to 0.816)
			High	47,775	0.993 (0.993 to 0.994)	0.714 (0.686 to 0.743)
North Caithness Cliffs	27,221	Included	Low	19,904	0.994 (0.993 to 0.995)	0.731 (0.685 to 0.779)
			High	17,764	0.992 (0.990 to 0.993)	0.650 (0.609 to 0.693)
		Excluded	Low	20,518	0.995 (0.993 to 0.996)	0.755 (0.709 to 0.804)
			High	18,488	0.993 (0.991 to 0.994)	0.681 (0.640 to 0.725)
St Abb's Head to Fast Castle	23,346	Included	Low	4,870	0.970 (0.968 to 0.971)	0.209 (0.191 to 0.226)
			High	3,150	0.961 (0.960 to 0.963)	0.135 (0.122 to 0.147)
		Excluded	Low	19,783	0.997 (0.996 to 0.998)	0.850 (0.797 to 0.906)
			High	18,242	0.995 (0.994 to 0.996)	0.785 (0.736 to 0.835)
Troup, Pennan and Lion's Heads	51,457	Included	Low	39,301	0.995 (0.994 to 0.996)	0.768 (0.731 to 0.805)
			High	35,244	0.993 (0.992 to 0.993)	0.687 (0.655 to 0.720)
		Excluded	Low	40,616	0.995 (0.995 to 0.996)	0.792 (0.756 to 0.829)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
			High	36,766	0.994 (0.993 to 0.994)	0.718 (0.684 to 0.751)
West Westray	13,320	Included	Low	8,008	0.990 (0.988 to 0.992)	0.601 (0.547 to 0.658)
			High	6,306	0.986 (0.984 to 0.987)	0.475 (0.431 to 0.524)
		Excluded	Low	8,611	0.992 (0.990 to 0.993)	0.649 (0.590 to 0.711)
			High	7,088	0.988 (0.986 to 0.989)	0.532 (0.481 to 0.583)
Option 2 and WCS: Consented Collisions						
Buchan Ness to Collieston Coast	53,373	Included	Low	39,786	0.994 (0.993 to 0.995)	0.743 (0.710 to 0.775)
			High	36,063	0.992 (0.992 to 0.993)	0.675 (0.644 to 0.706)
		Excluded	Low	41,049	0.995 (0.994 to 0.996)	0.768 (0.735 to 0.803)
			High	37,808	0.993 (0.992 to 0.994)	0.706 (0.675 to 0.739)
East Caithness Cliffs	121,395	Included	Low	74,159	0.993 (0.992 to 0.994)	0.802 (0.780 to 0.824)
			High	66,903	0.989 (0.989 to 0.990)	0.721 (0.699 to 0.740)
		Excluded	Low	75,495	0.993 (0.993 to 0.994)	0.816 (0.794 to 0.839)
			High	68,458	0.990 (0.990 to 0.991)	0.739 (0.719 to 0.760)
Farne Islands	20,799	Included	Low	15,620	0.994 (0.993 to 0.996)	0.752 (0.700 to 0.808)
			High	14,269	0.993 (0.991 to 0.994)	0.686 (0.638 to 0.737)
		Excluded	Low	18,260	0.997 (0.996 to 0.999)	0.875 (0.817 to 0.941)
			High	17,305	0.996 (0.995 to 0.998)	0.832 (0.775 to 0.892)
Flamborough and Filey Coast	220,108	Included	Low	151,077	0.993 (0.992 to 0.993)	0.686 (0.669 to 0.701)
			High	144,288	0.992 (0.991 to 0.992)	0.656 (0.639 to 0.671)
		Excluded	Low	153,190	0.993 (0.993 to 0.993)	0.696 (0.679 to 0.712)
			High	147,484	0.992 (0.992 to 0.993)	0.670 (0.654 to 0.685)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Forth Islands	20,539	Included	Low	13,449	0.992 (0.990 to 0.993)	0.655 (0.609 to 0.701)
			High	11,443	0.989 (0.987 to 0.990)	0.557 (0.516 to 0.599)
		Excluded	Low	16,148	0.995 (0.994 to 0.996)	0.786 (0.732 to 0.842)
			High	14,425	0.993 (0.992 to 0.994)	0.701 (0.653 to 0.752)
Fowlsheugh	66,925	Included	Low	42,760	0.991 (0.991 to 0.992)	0.639 (0.613 to 0.665)
			High	37,227	0.989 (0.988 to 0.989)	0.556 (0.532 to 0.578)
		Excluded	Low	51,159	0.995 (0.994 to 0.995)	0.764 (0.735 to 0.795)
			High	46,613	0.993 (0.992 to 0.994)	0.696 (0.667 to 0.723)
North Caithness Cliffs	27,221	Included	Low	19,617	0.994 (0.992 to 0.995)	0.719 (0.673 to 0.766)
			High	17,462	0.991 (0.990 to 0.992)	0.640 (0.599 to 0.684)
		Excluded	Low	20,208	0.994 (0.993 to 0.995)	0.742 (0.696 to 0.791)
			High	18,240	0.992 (0.991 to 0.993)	0.670 (0.626 to 0.714)
St Abb's Head to Fast Castle	23,346	Included	Low	4,816	0.970 (0.968 to 0.971)	0.207 (0.189 to 0.224)
			High	3,104	0.961 (0.959 to 0.963)	0.133 (0.120 to 0.145)
		Excluded	Low	19,591	0.997 (0.995 to 0.998)	0.842 (0.787 to 0.896)
			High	18,085	0.995 (0.994 to 0.996)	0.778 (0.729 to 0.830)
Troup, Pennan and Lion's Heads	51,457	Included	Low	38,764	0.995 (0.994 to 0.995)	0.755 (0.721 to 0.790)
			High	34,674	0.992 (0.992 to 0.993)	0.676 (0.643 to 0.708)
		Excluded	Low	39,877	0.995 (0.994 to 0.996)	0.779 (0.743 to 0.814)
			High	36,153	0.993 (0.992 to 0.994)	0.706 (0.672 to 0.739)
West Westray	13,320	Included	Low	7,724	0.989 (0.988 to 0.991)	0.579 (0.526 to 0.634)
			High	6,073	0.985 (0.983 to 0.986)	0.457 (0.413 to 0.503)
		Excluded	Low	8,271	0.991 (0.989 to 0.992)	0.625 (0.569 to 0.685)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
					High	0.987 (0.985 to 0.988)
Option 2 and WCS: As-built Collisions						
Buchan Ness to Collieston Coast	53,373	Included	Low	39,912	0.994 (0.994 to 0.995)	0.750 (0.716 to 0.783)
			High	36,381	0.992 (0.992 to 0.993)	0.681 (0.650 to 0.712)
		Excluded	Low	41,365	0.995 (0.994 to 0.996)	0.775 (0.741 to 0.811)
			High	38,102	0.993 (0.993 to 0.994)	0.713 (0.680 to 0.745)
East Caithness Cliffs	121,395	Included	Low	85,645	0.993 (0.993 to 0.994)	0.704 (0.683 to 0.727)
			High	71,778	0.990 (0.989 to 0.990)	0.591 (0.571 to 0.610)
		Excluded	Low	88,169	0.994 (0.993 to 0.994)	0.726 (0.703 to 0.749)
			High	75,162	0.991 (0.990 to 0.991)	0.617 (0.596 to 0.637)
Farne Islands	20,799	Included	Low	15,737	0.995 (0.993 to 0.996)	0.757 (0.704 to 0.812)
			High	14,370	0.993 (0.992 to 0.994)	0.691 (0.642 to 0.742)
		Excluded	Low	18,328	0.998 (0.996 to 0.999)	0.882 (0.821 to 0.946)
			High	17,431	0.997 (0.995 to 0.998)	0.839 (0.779 to 0.901)
Flamborough and Filey Coast	220,108	Included	Low	153,329	0.993 (0.992 to 0.993)	0.696 (0.679 to 0.713)
			High	146,468	0.992 (0.992 to 0.992)	0.666 (0.650 to 0.682)
		Excluded	Low	155,642	0.993 (0.993 to 0.994)	0.707 (0.690 to 0.723)
			High	149,629	0.992 (0.992 to 0.993)	0.680 (0.664 to 0.695)
Forth Islands	20,539	Included	Low	13,522	0.992 (0.991 to 0.993)	0.659 (0.612 to 0.708)
			High	11,515	0.989 (0.987 to 0.990)	0.560 (0.519 to 0.602)
		Excluded	Low	16,218	0.995 (0.994 to 0.997)	0.790 (0.737 to 0.846)
			High	14,513	0.993 (0.992 to 0.994)	0.705 (0.658 to 0.757)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Fowlsheugh	66,925	Included	Low	43,009	0.991 (0.991 to 0.992)	0.643 (0.617 to 0.669)
			High	37,407	0.989 (0.988 to 0.989)	0.558 (0.533 to 0.581)
		Excluded	Low	51,406	0.995 (0.994 to 0.996)	0.768 (0.737 to 0.798)
			High	46,955	0.993 (0.992 to 0.994)	0.700 (0.671 to 0.728)
North Caithness Cliffs	27,221	Included	Low	19,881	0.994 (0.993 to 0.995)	0.730 (0.683 to 0.778)
			High	17,676	0.992 (0.990 to 0.993)	0.649 (0.607 to 0.692)
		Excluded	Low	20,536	0.994 (0.993 to 0.996)	0.754 (0.705 to 0.802)
			High	18,431	0.992 (0.991 to 0.994)	0.680 (0.637 to 0.726)
St Abb's Head to Fast Castle	23,346	Included	Low	4,845	0.970 (0.968 to 0.971)	0.208 (0.190 to 0.225)
			High	3,134	0.961 (0.960 to 0.963)	0.134 (0.121 to 0.146)
		Excluded	Low	19,665	0.997 (0.996 to 0.998)	0.846 (0.793 to 0.902)
			High	18,211	0.995 (0.994 to 0.996)	0.782 (0.732 to 0.832)
Troup, Pennan and Lion's Heads	51,457	Included	Low	39,185	0.995 (0.994 to 0.996)	0.764 (0.729 to 0.800)
			High	35,140	0.993 (0.992 to 0.993)	0.684 (0.650 to 0.716)
		Excluded	Low	40,481	0.995 (0.995 to 0.996)	0.788 (0.751 to 0.826)
			High	36,601	0.993 (0.993 to 0.994)	0.714 (0.680 to 0.749)
West Westray	13,320	Included	Low	8,022	0.990 (0.988 to 0.992)	0.600 (0.545 to 0.660)
			High	6,302	0.985 (0.984 to 0.987)	0.474 (0.429 to 0.520)
		Excluded	Low	8,605	0.992 (0.990 to 0.993)	0.648 (0.587 to 0.707)
			High	7,048	0.988 (0.986 to 0.989)	0.530 (0.482 to 0.581)

3.4 Herring Gull

Proposed Development Alone

- 3.4.1 The results of the PVA for collision impacts to herring gull for the relevant SPA populations due to the Proposed Development alone are presented in Table 3.7 for the operational lifespan of the Proposed Development and Table 3.8 for a 50-year period. PVAs were run using consented mortalities only.

Table 3.7: Outputs for Proposed Development Alone Population Viability Analysis of Collision Impacts for Herring Gull for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impacted Simulated Population Size	Median Counterfactual (CI)	
			Growth Rate	Population Size
Buchan Ness to Collieston Coast	5,041	4,909	0.999 (0.997 to 1.002)	0.974 (0.885 to 1.068)
Fowlsheugh	2,513	2,399	0.999 (0.995 to 1.002)	0.959 (0.845 to 1.092)

Table 3.8: Outputs for Proposed Development Alone Population Viability Analysis of Collision Impacts for Herring Gull for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impacted Simulated Population Size	Median Counterfactual (CI)	
			Growth Rate	Population Size
Buchan Ness to Collieston Coast	5,458	5,205	0.999 (0.997 to 1.001)	0.957 (0.854 to 1.072)
Fowlsheugh	2,720	2,545	0.999 (0.996 to 1.001)	0.934 (0.798 to 1.092)

In-combination

- 3.4.2 The results of the PVA for collision impacts to herring gull for the relevant SPA populations due to the Proposed Development in-combination with other projects are presented in Table 3.9 for the operational lifespan of the Proposed Development and Table 3.10 for a 50-year period. PVAs were run using consented collision mortalities only.

Table 3.9: Outputs for In-combination Population Viability Analysis of Collision Impacts for Herring Gull for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Buchan Ness to Collieston Coast	5,041	NA ¹	4,690	0.998 (0.995 to 1.000)	0.931 (0.847 to 1.022)
Fowlsheugh	2,533	Included	2,243	0.996 (0.993 to 1.000)	0.891 (0.782 to 1.015)
		Excluded	2,268	0.997 (0.993 to 1.001)	0.909 (0.796 to 1.039)

¹SPA not impacted by Berwick Bank

Table 3.10: Outputs for In-combination Population Viability Analysis of Collision Impacts for Herring Gull for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Buchan Ness to Collieston Coast	5,458	NA ¹	4,813	0.998 (0.996 to 1.000)	0.889 (0.794 to 0.996)
Fowlsheugh	2,735	Included	2,251	0.996 (0.993 to 0.999)	0.827 (0.702 to 0.971)
		Excluded	2,329	0.997 (0.994 to 1.000)	0.856 (0.727 to 1.001)

¹SPA not impacted by Berwick Bank

3.5 Guillemot

Proposed Development Alone

- 3.5.1 The results of the PVA for displacement impacts to guillemot for the relevant SPA populations due to the Proposed Development alone are presented in Table 3.11 for the operational lifespan of the Proposed Development and Table 3.12 for a 50-year period.

Table 3.11: Outputs for Proposed Development Alone Population Viability Analysis of Displacement Impacts for Guillemot for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Buchan Ness to Collieston Coast	176,291	Low	170,006	0.999 (0.998 to 0.999)	0.966 (0.950 to 0.981)
		High	163,682	0.998 (0.997 to 0.998)	0.929 (0.914 to 0.944)
Fowlsheugh	431,357	Low	408,990	0.998 (0.998 to 0.999)	0.948 (0.938 to 0.958)
		High	385,919	0.996 (0.996 to 0.997)	0.894 (0.884 to 0.904)

Table 3.12: Outputs for Proposed Development Alone Population Viability Analysis of Displacement Impacts for Guillemot for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Buchan Ness to Collieston Coast	346,316	Low	326,912	0.999 (0.999 to 0.999)	0.944 (0.928 to 0.959)
		High	306,263	0.998 (0.997 to 0.998)	0.885 (0.870 to 0.901)
Fowlsheugh	847,230	Low	776,026	0.998 (0.998 to 0.998)	0.916 (0.906 to 0.926)
		High	703,838	0.996 (0.996 to 0.997)	0.831 (0.822 to 0.841)

In-combination

- 3.5.2 The results of the PVA for displacement impacts to guillemot for the relevant SPA populations due to the Proposed Development in-combination with other projects are presented in Table 3.13 for the operational lifespan of the Proposed Development and Table 3.14 for a 50-year period.

Table 3.13: Outputs for In-combination Population Viability Analysis of Displacement Impacts for Guillemot for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Buchan Ness to Collieston Coast	176,291	Included	Low	146,236	0.994 (0.994 to 0.994)	0.831 (0.817 to 0.845)
			High	114,797	0.986 (0.986 to 0.987)	0.652 (0.641 to 0.662)
		Excluded	Low	147,739	0.994 (0.994 to 0.995)	0.838 (0.824 to 0.851)
			High	116,976	0.987 (0.986 to 0.987)	0.664 (0.653 to 0.675)
Fowlsheugh	431,357	Included	Low	347,770	0.993 (0.993 to 0.993)	0.806 (0.798 to 0.815)
			High	285,102	0.987 (0.986 to 0.987)	0.661 (0.653 to 0.669)
		Excluded	Low	383,239	0.996 (0.996 to 0.996)	0.888 (0.879 to 0.898)
			High	340,270	0.992 (0.992 to 0.993)	0.789 (0.781 to 0.798)

Table 3.14: Outputs for In-combination Population Viability Analysis of Displacement Impacts for Guillemot for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Buchan Ness to Collieston Coast	346,316	Included	Low	254,880	0.994 (0.994 to 0.994)	0.737 (0.724 to 0.749)
			High	170,916	0.986 (0.986 to 0.987)	0.494 (0.484 to 0.503)
		Excluded	Low	258,652	0.994 (0.994 to 0.995)	0.747 (0.734 to 0.760)
			High	176,241	0.987 (0.987 to 0.987)	0.509 (0.500 to 0.519)
Fowlsheugh	847,230	Included	Low	593,563	0.993 (0.993 to 0.993)	0.701 (0.693 to 0.709)
			High	427,825	0.987 (0.986 to 0.987)	0.505 (0.499 to 0.511)
		Excluded	Low	696,507	0.996 (0.996 to 0.996)	0.823 (0.813 to 0.832)
			High	573,539	0.992 (0.992 to 0.993)	0.677 (0.669 to 0.685)

3.6 Razorbill

Proposed Development Alone

- 3.6.1 The results of the PVA for displacement impacts to razorbill for the relevant SPA populations due to the Proposed Development alone are presented in Table 3.15 for the operational lifespan of the Proposed Development and Table 3.16 for a 50-year period.

Table 3.15: Outputs for Proposed Development Alone Population Viability Analysis of Displacement Impacts for Razorbill for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Forth Islands	14,435	Low	14,296	1.000 (0.998 to 1.001)	0.993 (0.939 to 1.048)
		High	14,269	1.000 (0.998 to 1.001)	0.988 (0.936 to 1.042)
Fowlsheugh	35,100	Low	34,898	0.999 (0.998 to 1.000)	0.977 (0.944 to 1.011)
		High	34,390	0.999 (0.998 to 1.000)	0.962 (0.929 to 0.996)
St Abb's Head to Fast Castle	7,257	Low	7,231	1.000 (0.998 to 1.002)	0.995 (0.924 to 1.072)
		High	7,212	1.000 (0.998 to 1.002)	0.992 (0.918 to 1.070)
Troup, Pennan and Lion's Head	11,415	Low	11,375	1.000 (0.998 to 1.001)	0.995 (0.937 to 1.059)
		High	11,321	1.000 (0.998 to 1.001)	0.992 (0.935 to 1.053)

Table 3.16: Outputs for Proposed Development Alone Population Viability Analysis of Displacement Impacts for Razorbill for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
				Growth Rate	Population Size
Forth Islands	18,903	Low	18,747	1.000 (0.999 to 1.001)	0.989 (0.929 to 1.051)
		High	18,510	1.000 (0.999 to 1.001)	0.981 (0.921 to 1.040)
Fowlsheugh	46,207	Low	44,940	0.999 (0.999 to 1.000)	0.963 (0.926 to 1.001)
		High	43,781	0.999 (0.998 to 0.999)	0.939 (0.902 to 0.975)
St Abb's Head to Fast Castle	9,591	Low	9,522	1.000 (0.998 to 1.001)	0.992 (0.912 to 1.079)
		High	9,414	1.000 (0.998 to 1.001)	0.987 (0.906 to 1.074)
Troup, Pennan and Lion's Heads	14,971	Low	14,870	1.000 (0.999 to 1.001)	0.991 (0.925 to 1.063)
		High	14,846	1.000 (0.999 to 1.001)	0.987 (0.921 to 1.059)

In-combination

- 3.6.2 The results of the PVA for displacement impacts to razorbill for the relevant SPA populations due to the Proposed Development in-combination with other projects are presented in Table 3.17 for the operational lifespan of the Proposed Development and Table 3.18 for a 50-year period.

Table 3.17: Outputs for In-combination Population Viability Analysis of Displacement Impacts for Razorbill for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
East Caithness Cliffs	78,286	Included	Low	68,350	0.996 (0.995 to 0.996)	0.872 (0.851 to 0.893)
			High	59,620	0.991 (0.991 to 0.992)	0.761 (0.741 to 0.780)
		Excluded	Low	68,734	0.996 (0.995 to 0.996)	0.877 (0.856 to 0.899)
			High	60,354	0.992 (0.991 to 0.992)	0.772 (0.753 to 0.792)
Flamborough and Filey Coast	70,681	Included	Low	58,802	0.994 (0.993 to 0.995)	0.833 (0.811 to 0.853)
			High	49,897	0.989 (0.988 to 0.989)	0.705 (0.685 to 0.724)
		Excluded	Low	59,039	0.994 (0.994 to 0.995)	0.836 (0.815 to 0.856)
			High	50,450	0.989 (0.988 to 0.990)	0.713 (0.694 to 0.731)
Forth Islands	14,435	Included	Low	11,216	0.992 (0.990 to 0.993)	0.779 (0.736 to 0.825)
			High	9,008	0.985 (0.983 to 0.986)	0.623 (0.587 to 0.659)
		Excluded	Low	11,802	0.994 (0.992 to 0.995)	0.820 (0.774 to 0.866)
			High	9,837	0.988 (0.986 to 0.989)	0.682 (0.643 to 0.722)
Fowlsheugh	35,728	Included	Low	30,050	0.994 (0.994 to 0.995)	0.841 (0.811 to 0.871)
			High	25,907	0.990 (0.989 to 0.991)	0.727 (0.701 to 0.754)
		Excluded	Low	30,803	0.995 (0.994 to 0.996)	0.862 (0.832 to 0.893)
			High	27,108	0.991 (0.990 to 0.992)	0.761 (0.733 to 0.788)
St Abb's Head to Fast Castle	7,257	Included	Low	6,434	0.996 (0.994 to 0.998)	0.885 (0.819 to 0.954)
			High	5,615	0.992 (0.990 to 0.994)	0.774 (0.715 to 0.836)
		Excluded	Low	6,921	0.998 (0.997 to 1.001)	0.954 (0.884 to 1.028)
			High	6,412	0.996 (0.994 to 0.998)	0.885 (0.817 to 0.957)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Troup, Pennan and Lion's Heads	11,415	Included	Low	10,411	0.997 (0.995 to 0.999)	0.911 (0.855 to 0.968)
			High	9,310	0.994 (0.992 to 0.995)	0.818 (0.766 to 0.870)
		Excluded	Low	10,510	0.997 (0.996 to 0.999)	0.918 (0.863 to 0.976)
			High	9,521	0.994 (0.993 to 0.996)	0.835 (0.782 to 0.887)

Table 3.18: Outputs for In-combination Population Viability Analysis of Displacement Impacts for Razorbill for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
East Caithness Cliffs	102,556	Included	Low	81,850	0.996 (0.995 to 0.996)	0.798 (0.775 to 0.820)
			High	65,417	0.991 (0.991 to 0.992)	0.637 (0.618 to 0.655)
		Excluded	Low	82,567	0.996 (0.995 to 0.996)	0.805 (0.783 to 0.828)
			High	67,084	0.992 (0.991 to 0.992)	0.654 (0.634 to 0.672)
Flamborough and Filey Coast	92,928	Included	Low	68,640	0.994 (0.994 to 0.995)	0.740 (0.717 to 0.761)
			High	52,395	0.989 (0.988 to 0.989)	0.562 (0.544 to 0.580)
		Excluded	Low	69,095	0.994 (0.994 to 0.995)	0.745 (0.723 to 0.766)
			High	53,230	0.989 (0.989 to 0.990)	0.573 (0.555 to 0.591)
Forth Islands	18,903	Included	Low	12,475	0.992 (0.991 to 0.993)	0.663 (0.619 to 0.709)
			High	8,679	0.985 (0.984 to 0.986)	0.459 (0.427 to 0.490)
		Excluded	Low	13,677	0.994 (0.992 to 0.995)	0.721 (0.673 to 0.767)
			High	10,064	0.988 (0.987 to 0.989)	0.533 (0.496 to 0.568)

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Fowlsheugh	46,207	Included	Low	35,151	0.994 (0.994 to 0.995)	0.753 (0.721 to 0.783)
			High	27,595	0.990 (0.989 to 0.990)	0.592 (0.567 to 0.617)
		Excluded	Low	36,616	0.995 (0.995 to 0.996)	0.784 (0.753 to 0.815)
			High	29,690	0.991 (0.990 to 0.992)	0.637 (0.611 to 0.664)
St Abb's Head to Fast Castle	9,591	Included	Low	7,802	0.996 (0.995 to 0.997)	0.817 (0.747 to 0.889)
			High	6,284	0.992 (0.990 to 0.993)	0.656 (0.599 to 0.716)
		Excluded	Low	8,870	0.998 (0.997 to 1.000)	0.926 (0.850 to 1.008)
			High	7,846	0.996 (0.995 to 0.998)	0.817 (0.748 to 0.892)
Troup, Pennan and Lion's Heads	14,971	Included	Low	12,834	0.997 (0.996 to 0.998)	0.857 (0.798 to 0.919)
			High	10,756	0.994 (0.992 to 0.995)	0.718 (0.666 to 0.770)
		Excluded	Low	13,023	0.997 (0.996 to 0.998)	0.869 (0.809 to 0.930)
			High	11,115	0.994 (0.993 to 0.995)	0.743 (0.690 to 0.796)

3.7 Puffin

Proposed Development Alone

- 3.7.1 Proposed Development alone PVAs were not conducted for puffin as no Proposed Development alone impacts exceeded a 0.02 percentage point decrease in survival (Table 2.11).

In-combination

- 3.7.2 The results of the PVA for displacement impacts to puffin for the relevant SPA populations due to the Proposed Development in-combination with other projects are presented in Table 3.19 for the operational lifespan of the Proposed Development and Table 3.20 for a 50-year period.

Table 3.19: Outputs for In-combination Population Viability Analysis of Displacement Impacts for Puffin for the Operational Lifespan of the Proposed Development (30 years). Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Coquet Island	7,979	Included	Low	7,903	1.000 (0.998 to 1.001)	0.987 (0.939 to 1.040)
			High	7,843	0.999 (0.998 to 1.001)	0.980 (0.933 to 1.032)
		Excluded	Low	7,929	1.000 (0.998 to 1.001)	0.991 (0.943 to 1.044)
			High	7,878	1.000 (0.998 to 1.001)	0.986 (0.938 to 1.039)
Farne Islands	13,969	Included	Low	13,678	0.999 (0.998 to 1.001)	0.982 (0.946 to 1.019)
			High	13,542	0.999 (0.998 to 1.000)	0.970 (0.934 to 1.008)
		Excluded	Low	13,776	1.000 (0.998 to 1.001)	0.987 (0.951 to 1.025)
			High	13,685	0.999 (0.998 to 1.000)	0.980 (0.943 to 1.017)
Forth Islands	12,723	Included	Low	11,739	0.997 (0.996 to 0.999)	0.921 (0.884 to 0.959)
			High	11,180	0.996 (0.994 to 0.997)	0.874 (0.839 to 0.910)
		Excluded	Low	11,847	0.998 (0.996 to 0.999)	0.928 (0.892 to 0.966)
			High	11,317	0.996 (0.995 to 0.997)	0.886 (0.851 to 0.922)

Table 3.20: Outputs for In-combination Population Viability Analysis of Displacement Impacts for Puffin for a 50-year Period. Confidence Intervals (CI) are Given in Parentheses

SPA	Baseline Simulated Population Size	Berwick Bank Included or Excluded	Impact Scenario	Impacted Simulated Population Size	Median Counterfactual (CI)	
					Growth Rate	Population Size
Coquet Island	3,509	Included	Low	3,443	1.000 (0.998 to 1.001)	0.980 (0.905 to 1.062)
			High	3,399	0.999 (0.998 to 1.001)	0.969 (0.895 to 1.055)
		Excluded	Low	3,467	1.000 (0.998 to 1.001)	0.985 (0.909 to 1.069)
			High	3,430	1.000 (0.998 to 1.001)	0.977 (0.897 to 1.061)
Farne Islands	6,121	Included	Low	5,964	0.999 (0.998 to 1.001)	0.969 (0.913 to 1.031)
			High	5,851	0.999 (0.998 to 1.000)	0.951 (0.894 to 1.010)
		Excluded	Low	5,995	1.000 (0.998 to 1.001)	0.978 (0.921 to 1.039)
			High	5,943	0.999 (0.998 to 1.001)	0.966 (0.910 to 1.027)
Forth Islands	5,620	Included	Low	4,908	0.997 (0.996 to 0.999)	0.872 (0.816 to 0.931)
			High	4,511	0.996 (0.994 to 0.997)	0.802 (0.749 to 0.856)
		Excluded	Low	4,947	0.998 (0.996 to 0.999)	0.885 (0.827 to 0.943)
			High	4,597	0.996 (0.995 to 0.997)	0.820 (0.766 to 0.874)

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