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# Volume 7B Proposed Development (Offshore) Appendices

## Appendix 6-4 Population Viability Analysis

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# Volume 7B Appendix 6-4 Population Viability Analysis

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# Acronyms and Abbreviations

| | |
|---|---|
| **BDMPS** | Biologically Defined Minimum Population Scale |
| **BTO** | British Trust for Ornithology |
| **CPGR** | Counterfactual Population Growth Rate |
| **CPS** | Counterfactual Population Size |
| **EIAR** | Environmental Impact Assessment Report |
| **JNCC** | Joint Nature Conservation Committee |
| **OWF** | Offshore Wind Farm |
| **PVA** | Population Viability Analysis |
| **SMP** | Seabird Monitoring Programme |
| **WCS** | Worst Case Scenario |
| **WTG** | Wind Turbine Generator |

# 1 Introduction

## 1.1 The Proposed Development (Offshore)

1.1.1.1 This Technical Report provides background information, sets out the methodology for, and presents the results of Population Viability Analysis (PVA) for the proposed Caledonia Offshore Wind Farm (OWF), hereafter referred to as the "Proposed Development (Offshore)", located in the Moray Firth, Scotland. Only EIA level PVA is presented here, assessing the Project Alone and Cumulative scenarios for the regional populations of seabird species scoped into assessment. The Report to Inform Appropriate Assessment is informed by colony specific assessments presented in Application Document 13, Appendix 13-2 and Application Document 14, Appendix 14-2.

1.1.1.2 The Proposed Development (Offshore) will be developed in two phases (see Volume 1, Chapter 5: Programme and Phasing). Therefore, two marine licence applications are being submitted, referred to as Caledonia North and Caledonia South. It is assumed that construction of the two application areas could be progressed in either order (e.g. Caledonia North constructed in the first phase, then Caledonia South in the second phase, or vice-versa) or concurrently. This has been assessed within a single Environmental Impact Assessment Report (EIAR) covering the Proposed Development (Offshore) as well as Caledonia North and Caledonia South alone. Key information for Caledonia North and Caledonia South has been replicated within their respective EIAs, with the main body of the PVA outputs presented within the Caledonia OWF EIA and this report with additional details.

1.1.1.3 PVA has been modelled for Project Alone for Caledonia North, Caledonia South and the Proposed Development (Offshore) where necessary to estimate the effect that the Proposed Development (Offshore) may have upon ornithological populations. The predicted mortalities for Caledonia North, Caledonia South and the Proposed Development (Offshore) have been presented as a worst-case scenario (WCS); i.e., with respect to collision risk, the largest number of the smallest wind turbine generators (WTG) considered within the design envelope for the Proposed Development (Offshore). The Proposed Development (Offshore) WCS is based on the maximum number of WTGs (fixed and floating) that could be constructed, rather than an addition of Caledonia North and Caledonia South, as to base the design on this assumption would overestimate potential impacts. The WCS for the Proposed Development (Offshore) is being progressed within the EIA cumulative assessments. For more information on the project design scenarios, refer to Volume 1, Chapter 3: Proposed Development Description (Offshore) and Volume 1, Chapter 5: Proposed Development Phasing.

## 1.2 Population Viability Analysis (PVA)

1.2.1.1 Marine renewable energy developments potentially impact seabirds through impact pathways such as displacement and barrier effects as a result of the presence of wind turbines and collision with turbine blades. These processes impact seabirds at an individual level but also have the potential to affect the productivity of a population, and/or increase baseline mortality within a population. Part of the Environmental Impact Assessment (EIA) process includes the assessment of these potential effects at a range of population scales.

1.2.1.2 For breeding seabirds, distributional responses includes both barrier effects and displacement. The use of 'distributional response' for this report therefore includes habitat displacement effects as well as barrier effects as there is no accepted method of defining these from survey data.

1.2.1.3 For species predicted to have high mortality rates due to distributional response and/or collision risk, it is particularly important to assess the impact of these potential mortalities on Special Protection Area (SPA) populations. SPA-specific assessments are presented in detail in the Application Document 13, Appendix 13-2 and Application Document 14, Appendix 14-2. Population Viability Analysis (PVA) is often used to estimate the population level effects of predicted impacts, either alone or in combination with other factors (e.g. impacts from other developments), on a designated feature population. PVA provides a robust, simplistic framework using demographic parameters to project future population trends under different scenarios over a set period, comparing 'baseline' conditions with 'impact' scenarios by altering parameters such as survival based on predicted OWF impacts and productivity. Baseline conditions assume no additional impact, allowing the population to follow its "natural" growth rate (based on a range of assumptions), while impact scenarios account for the predicted impacts of a given development (or developments) over a defined period and estimate the effects of the predicted impacts on the population.

1.2.1.4 PVA was undertaken using the Seabird PVA Tool developed by UKCEH and BioSS, under contract to Natural England and JNCC (Searle *et al*., (2019)). The Seabird PVA Tool was accessed via the 'Shiny App' interface, which acts as user-friendly graphical user interface for using the functions built within the nepva r package.

1.2.1.5 PVAs were modelled for bird species and populations which have been predicted by the EIA to potentially experience a change above the guidance threshold of 0.02% change in adult survival rate (NatureScot, 2023[1]; Guidance Note 11).

1.2.1.6 For the Proposed Development alone (i.e. Project Alone scenarios), this included:

- Distributional response (with other nearby offshore developments excluded, i.e. Project Alone impacts):
    - Guillemot (breeding season, annual) for Caledonia South and Proposed Development (Offshore).
    - Razorbill (breeding season) for the Proposed Development (Offshore).
    - Puffin (non-breeding season) for the Proposed Development (Offshore).

1.2.1.7 No species scenarios met the threshold where a PVA is required for Project Alone collision or combined impacts.

1.2.1.8 For the cumulative scenarios, three cumulative project scenario were assessed as outlined below. Each cumulative scenario included consideration of Guidance Approach and Applicant Approach. The rational for the parameters of these approaches are set out in (Volume 2, Chapter 6: Offshore Ornithology).

1.2.1.9 The cumulative project scenarios where the EIA predicted the regional population to potentially experience a change above the guidance threshold of 0.02% change in adult survival rate (Guidance Note 11) were:

- All projects within foraging range including the Proposed Development
    - Guillemot
    - Razorbill
    - Puffin (Guidance Approach and Applicant Approach)
    - Herring Gull
    - Greater black-backed gull
    - Kittiwake (Distributional response, Collision and combined distributional response and collision)
    - Gannet (Distributional response, Collision (Guidance Approach and Applicant Approach) and combined Distributional response and Collision (Guidance Approach and Applicant Approach))
- All projects within foraging range including the Proposed Development excluding Berwick Bank Offshore Wind Farm
    - Guillemot
    - Razorbill
    - Puffin (Guidance Approach)

  - Puffin (Applicant Approach)
  - Herring Gull
  - Greater black-backed gull
  - Kittiwake (Distributional response, Collision and combined distributional response and collision)
  - Gannet (Distributional response, Collision (both Guidance Approach and Applicant Approach) and combined distributional response and collision (both Guidance Approach and Applicant Approach))
- All consented projects within foraging range consented projects excluding the Proposed Development
  - Guillemot
  - Razorbill
  - Puffin (Guidance Approach)
  - Puffin (Applicant Approach)
  - Herring Gull
  - Greater black-backed gull
  - Kittiwake (Distributional response, Collision and combined distributional response and collision)
  - Gannet (Distributional response, Collision (both Guidance Approach and Applicant Approach) and combined distributional response and collision (both Guidance Approach and Applicant Approach)

1.2.1.10 No specific EIA level PVA was not carried out for Caledonia North and Caledonia South. Caledonia North and Caledonia South specific PVAs are presented within Application Document 13, Appendix 13-2 and Application Document 14, Appendix 14-2.

# 2 Methodology

## 2.1 Introduction

2.1.1.1 This section sets out the PVA process conducted for the EIA for the Proposed Development (Offshore), Caledonia North and Caledonia South.

2.1.1.2 Scenarios were modelled where impacts exceeded the threshold for assessment (0.02 percentage point change in adult survival rate). This is the standard threshold for PVA assessment (NatureScot, 2023[1]). Three receptors were found to qualify for further assessment through PVA due to the predicted mortalities attributed to the Proposed Development (Offshore) alone during specific seasons or annually, with a single receptor found to qualify for further assessment through PVA due to the predicted mortalities attributed to Caledonia North and Caledonia South alone annually.

## 2.2 PVA Model

2.2.1.1 The NatureScot (2023[1]) Guidance Note 11 was followed to undertake PVA. Based on this guidance, and as agreed in consultation, the PVA Tool developed by UKCEH and BioSS, under contract to Natural England and JNCC (Searle *et al.*, 2019[2]) and its associated updates was used to carry out PVA.

2.2.1.2 The demographic parameters used for PVA are presented in Table 2-1.

2.2.1.3 The Seabird PVA Tool is a user-friendly interface accessible via a standard web-browser using the software "R" (a free software environment for statistical computing). The tool uses the nepva R package to perform the modelling and analysis set out in this report. For these analyses nepva tool v 2.0 (nepva R package: v 4.18 Interface: v 1.7) was used.

## 2.3 Modelling Approach

2.3.1.1 All PVA models were undertaken using the 'Simulation' run type. Simulation runs are used to simulate population trajectories based on the specified demographic parameters, initial population sizes and scenarios.

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

2.3.1.3 A stochastic model produces probabilistic outputs to account for the impact of environmental and demographic stochasticity. Environmental stochasticity describes the effects random variation in factors such as weather can have on a population and is modelled by the incorporation of randomly generated values for the probability of survival from one-time step to the next. Demographic stochasticity refers to the effect of random variation in population structure on demographic rates and is modelled by generating random numbers of surviving individuals for any given survival probability. Demographic stochasticity can usually be ignored for populations greater than 100 individuals, however including demographic stochasticity will not cause any penalty when simulating larger populations (WWT Consulting, 2012[3]).

2.3.1.4 All PVA modelling in this report was undertaken with environmental and demographic stochasticity. The number of simulations runs were set to 5,000 and were ran for the expected lifespan of the Proposed Development (Offshore), Caledonia North and Caledonia South (35 years). As per NatureScot guidance, outputs for the PVAs for 25 years and 50 years are also presented in Section 5.

2.3.1.5 Additional "burn-in" time of ten years were included in each model. Burn-in allows the population model to stabilise, with the period of where initial population structure instability (i.e. an in balance of immature-matures) may influence the model outputs. After several years, the modelled structure becomes stable allowing appropriate outputs to be taken. This is informed by internal model parameterisation during the burn-in period.

2.3.1.6 Demographic processes such as growth, survival, productivity and recruitment are density-dependent, as their rates change in relation to the number of individuals in a population. Density dependence can be described as either compensatory or depensatory (Begon *et al*., 2005[4]). Compensation is characterised by demographic changes that cause a stabilising effect on a populations long-term average. Depensation acts to further decrease the rate of population growth in declining populations and can delay the rate of recovery. This is typically exhibited in populations that have been significantly depleted in size and is caused by a reduction in the benefits associated with conspecific presence.

2.3.1.7 Density dependence is self-evident in the natural environment, as without it, populations would grow exponentially. For seabird populations, the mechanisms as to how this operates are largely uncertain, or where known this is evidently highly variable. If density dependence is mis-specified in a PVA, the modelled predictions may be unreliable. Therefore, it is more typical to use density independent models for seabird assessments, despite the lack of biologically necessary density dependence. As such, density independent models lack any means by which a population can recover once it has been reduced beyond a certain point, they are therefore appropriate for impact assessment purposes on the grounds of precaution

(i.e., another source of precaution in the assessment process) (Ridge et al 2019[5]). Conversely, this also means that population projections can trend in as an exponential function with no effective carrying capacity. As the populations in this assessment show highly varying trends with some in decline or poor data status, it is deemed density dependent methods are not appropriate for this assessment. Density independent models have therefore been used.

## 2.4 Model Parameters

### 2.4.1 Demographic rates and population

2.4.1.1 Survival and productivity rates for each species were derived from Horswill and Robinson (2015[6]). These rates are provided in Table 2-1 with further explanation provided below.

2.4.1.2 Survival rates vary between age classes, with 0-1 representing birds under the age of one year, class 1-2 representing birds under the age of two, class 2-3 includes birds at age 2 etc. Adults are grouped as survival rates tend to be consistent at maturity despite actual age.

2.4.1.3 The age at first breeding and maximum brood size per pair parameters were selected from the pre-formulated values within the PVA Tool (Searle et al., 2019[2]).

2.4.1.4 The breeding season populations used for PVA were derived using each species' mean maximum plus one standard deviation (MMFR+1SD) foraging range as detailed within Volume 2, Chapter 6: Offshore Ornithology.

2.4.1.5 For the non-breeding season, impacts were based on a regional population estimate, calculated from the most up to date colony counts as available on the Seabird Monitoring Programme (SMP) database.

2.4.1.6 Where annual assessments were completed, the reference population was defined as the largest of the individual seasonal regional populations (see Volume 2, Chapter 6: Offshore Ornithology).

2.4.1.7 The initial population size used to calculate the change to the adult annual survival for each scenario is presented in Table 2-2. These are the current estimated seasonal and annual biogeographic population size as presented in Volume 2, Chapter 6: Offshore Ornithology, along with season definitions as agreed in consultation.

Table 2-1: Summary of demographic rates for PVA species. Source: Horswill and Robinson (2015[11]) unless described in text as separate calculation.

| Demographic and Population Parameters | Adult Survival (SD) | Productivity (SD) (per pair) | Age of Recruitment | Brood size (per pair) | Survival 0-1 (SD) | Survival 1-2 (SD) | Survival 2-3 (SD) | Survival 3-4 (SD) | Survival 4-5 (SD) | Survival 5-6 (SD) |
|---|---|---|---|---|---|---|---|---|---|---|
| Guillemot | 0.939 (±0.015) | 0.672 (±0.147) | 6 | 1 | 0.56 (±0.001) | 0.792 (±0.001) | 0.917 (±0.001) | 0.917 (±0.001) | 0.939 (±0.001) | 0.939 (±0.001) |
| Razorbill | 0.895 (±0.067) | 0.57 (±0.247) | 5 | 1 | 0.63 (±0.209) | 0.63 (±0.209) | 0.63 (±0.209) | 0.895 (±0.067) | 0.895 (±0.067) | - |
| Puffin | 0.906 (±0.083) | 0.617 (±0.151) | 5 | 1 | 0.709 (±0.001) | 0.709 (±0.001) | 0.709 (±0.001) | 0.760 (±0.001) | 0.805 (±0.001) | 0.906 (±0.083) |
| Kittiwake | 0.854 (±0.051) | 0.690 (±0.296) | 4 | 2 | 0.790 (±0.001) | 0.854 (±0.051) | 0.854 (±0.051) | 0.854 (±0.051) | 0.854 (±0.051) | 0.854 (±0.051) |
| Gannet | 0.919 (0.042) | 0.7 (0.082) | 5 | 1 | 0.424 (±0.045) | 0.829 (±0.026) | 0.891 (±0.019) | 0.895 (±0.019) | 0.895 (±0.042) | - |
| Herring gull | 0.834 (0.034) | 0.92 (0.477) | 5 | 3 | 0.798± (0.092) | 0.834 ( ±0.034) | 0.834 ( ±0.034) | 0.834 ( ±0.034) | 0.834 ( ±0.034) | - |
| Greater black backed gull | 1.111 (±0.637) | 0.885 (±0.022) | 5 | 1 | 0.798± (0.092) | 0.834 ( ±0.034) | 0.834 ± (0.034) | 0.834 ( ±0.034) | 0.834 ( ±0.034) | - |

Table 2-2: Season specific regional populations sizes used in Assessment and associated baseline mortalities.

| Species | Season | Regional Population Size | Baseline Mortality |
|---|---|---|---|
| Guillemot | Breeding | 1,307,476 | 180,432 |
| | Non-breeding | 1,307,476 | 180,432 |
| | Annual | 1,307,476 | 180,432 |
| Razorbill | Breeding | 236,479 | 45,641 |
| | Non-breeding | 591,874 | 114,232 |
| | Annual | 591,874 | 114,232 |
| Puffin | Breeding | 723,851 | 126,657 |
| | Non-breeding | 231,957 | 40,593 |
| | Annual | 723,851 | 126,657 |
| Kittiwake | Breeding | 496,826 | 77,505 |
| | Non-breeding | 829,937 | 129,471 |
| | Annual | 829,937 | 129,471 |
| Gannet | Breeding | 920,514 | 172,136 |
| | Non-breeding | 456,298 | 85,328 |
| | Annual | 920,514 | 172,136 |
| Herring gull | Breeding | 42,584 | 7,324 |
| | Non-breeding | 466,511 | 80,240 |
| | Annual | 466,511 | 80,240 |
| Greater Black backed gull | Breeding | 4,753 | 760 |
| | Non-breeding | 91,399 | 14,624 |
| | Annual | 91,399 | 14,624 |
| Further information on their calculation and season definition can be found in Volume 2, Chapter 6: Offshore Ornithology. | | | |

### 2.4.2 Impacts Assessed

*Project Alone*

2.4.2.1 The impact predicted from the Proposed Development (Offshore) was, Caledonia North and Caledonia South were parametrised as 'relative harvest' (the increase in baseline mortality rate as a result of the impact rather than the overall impact in terms of numbers of birds annually), as per the PVA guidance (Guidance Note 11).

2.4.2.2 Each PVA simulation run included a baseline scenario that was paired with an impact scenario. The baseline scenario estimated population changes based on the baseline mortality rate, and the impact scenario estimated population change with the additional predicted mortality due to distributional response effects. The additional mortality was calculated as a proportion of the initial population and applied to the adult age class only.

2.4.2.3 For the three species and relevant seasons in scope for assessment, a range of impact levels have been modelled based on the Guidance approach and Applicant approach (Table 2-3).

2.4.2.4 Each impact scenario includes additional predicted population-level mortality due distributional response. This increased mortality affects the survival rate, thereby predicting the impact magnitude on the population under different scenarios. The model used relative harvest, calculated based on the predicted mortalities apportioned to the site and the initial regional population size. These scenarios are detailed in Table 2-3.

*Cumulative Assessment*

2.4.2.5 The impact predicted on seabird populations from cumulative impacts from offshore wind developments are predominantly based on the Northeast and East Scotwind Projects Cumulative totals dataset, with the addition/update of abundance and collision totals for Dogger Bank South or derived from development specific EIAR documentation.

2.4.2.6 Model set up and parameterisation matched with project alone methodology described above.

Table 2-3: Relative harvest PVA input from distributional response.

| Species | Approach | Season | Site | Impact Rates | Predicted Additional Mortality (no of birds) | Percent point change from baseline mortality |
|---|---|---|---|---|---|---|
| Guillemot | Guidance Approach | Breeding | Proposed Development (Offshore) | 60% Displacement, 3% Mortality | 289.65 | 0.022 |
| | | Annual | Proposed Development (Offshore) | | 329.91 | 0.025 |
| | | Breeding | Proposed Development (Offshore) | 60% Displacement , 5% Mortality | 482.7 | 0.037 |
| | | | Caledonia South | | 339.69 | 0.026 |
| | | Annual | Proposed Development (Offshore) | | 603.53 | 0.046 |
| | | | Caledonia South | | 443.87 | 0.034 |
| Razorbill | Guidance Approach | Breeding | Proposed Development (Offshore) | 60% Displacement , 5% Mortality | 52.86 | 0.022 |
| Puffin | Guidance Approach | Non-Breeding | Proposed Development (Offshore) | 60% Displacement , 3% Mortality | 54.08 | 0.023 |
| Note, scenarios which did not meet the threshold requiring PVA are presented in Volume 2, Chapter 6: Offshore Ornithology. | | | | | | |

### 2.4.3 PVA outputs

2.4.3.1 The outputs from the PVA tool focus on the counterfactual of population growth rate (CGR) and counterfactual of population size (CPS) (Searle *et al.*, 2019[2]). These metrics compare impacted and unimpacted scenarios, enabling interpretation of the predicted impact on the population (Cook and Robinson, 2016[7]). CPS represents the median ratio of the final size of the impacted population to the baseline (unimpacted) population. CPGR represents the median ratio of the annual growth rate of the impacted population to that of the unimpacted population. Both metrics are expressed as proportions.

2.4.3.2 Outputs are presented as The Proposed Development (Offshore) alone, Caledonia North alone, Caledonia South alone, along with cumulative assessment for The Proposed Development (Offshore) as this is the worst case scenario in terms of impacts within a given season. Caledonia North and Caledonia South specific impacts are presented within Application Document 13, Appendix 13-2 and Application Document 14, Appendix 14-2.

# 3 Results – Project Alone

## 3.1 Introduction

3.1.1.1 The outputs from the PVA Tool are presented in Tables 3-1 to 3-3 for the three species and relevant seasons requiring PVA.

## 3.2 Guillemot

3.2.1.1 Table 3-1 presents the PVA results for project alone impacts for guillemot during the breeding season and annually when considering the relevant regional population estimates for the proposed project time scale (35 years).

## 3.3 Razorbill

3.3.1.1 Table 3-2 presents the PVA results for project alone impacts for razorbill during the breeding season and annually when considering the relevant regional population estimates derived from Furness (2015) for the proposed project time scale (35 years).

## 3.4 Puffin

3.4.1.1 Table 3-3 presents the PVA results for puffin during the non-breeding when considering the relevant regional population estimates derived from Furness (2015).

Table 3-1. Guillemot PVA Project Alone results using Seabird PVA Tool for Proposed Development (Offshore), Caledonia North and Caledonia South.

| Approach | Season | Site | Impact Rates | Median CGR | Median CPS | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|---|
| Guidance Approach | Breeding | Proposed Development (Offshore) | 60% Displacement, 3% Mortality | 0.999 ± <0.001 | 0.994 ± 0.002 | 0.025 | 0.641 |
| | Annual | Proposed Development (Offshore) | | 0.999 ± <0.001 | 0.993 ± 0.002 | 0.028 | 0.732 |
| | Breeding | Proposed Development (Offshore) | 60% Displacement, 5% Mortality | 0.999 ± <0.001 | 0.989 ± 0.002 | 0.042 | 1.080 |
| | | Caledonia South | | 0.999 ± <0.001 | 0.992 ± 0.002 | 0.029 | 0.761 |
| | Annual | Proposed Development (Offshore) | | 0.999 ± <0.001 | 0.987 ± 0.002 | 0.052 | 1.338 |
| | | Caledonia South | | 0.999 ± <0.001 | 0.986 ± 0.002 | 0.038 | 0.992 |

Table 3-2. Razorbill PVA Project Alone results using Seabird PVA Tool.

| Approach | Season | Site | Impact Rates | Median CGR | Median CPS | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|---|
| Guidance Approach | Breeding | The Proposed Development (Offshore) | 60% Displacement, 5% Mortality | 0.999 ± <0.001 | 0.993 ± (0.011) | 0.026 | 0.673 |

Table 3-3. Puffin PVA Project Alone results using Seabird PVA Tool.

| Approach | Season | Site | Impact Rates | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|---|
| Guidance Approach | Non-breeding | The Proposed Development (Offshore) | 60% displacement, 3% mortality | 0.999 (±<0.001) | 0.993 (±0.013) | 0.027 | 0.687 |

# 4 Results - Cumulative

## 4.1 Introduction

4.1.1.1 Sections 4.2-4.7 present the outputs from the cumulative PVA assessment for the scenarios detailed in Section 1.2.1.9 of this report. The impact values for these scenarios are calculated from . All other scenarios considered for The Proposed Development did not meet the PVA threshold of 0.02% point change in baseline mortality.

## 4.2 Guillemot

Table 4-1: presents the cumulative PVA results for guillemot when considering the relevant regional population estimates derived from the SMP.

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| All developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.978 (±0.002) | 0.03 | 1.25 |
| | | Non-breeding | 1.000 (±<0.001) | 0.987 (±0.002) | 0.04 | 1.29 |
| | | Annual | 0.999 (±<0.001) | 0.975 (±0.002) | 0.07 | 2.52 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.955 (±0.002) | 0.13 | 4.49 |
| | | Non-breeding | 1.000 (±<0.001) | 0.985 (±0.002) | 0.04 | 1.53 |
| | | Annual | 0.998 (±<0.001) | 0.941 (±0.002) | 0.17 | 5.95 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.927 (±0.002) | 0.21 | 7.35 |
| | | Non-breeding | 0.999 (±<0.001) | 0.954 (±0.002) | 0.13 | 4.56 |
| | | Annual | 0.997 (±<0.001) | 0.884 (±0.002) | 0.34 | 11.58 |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.988 (±0.002) | 0.03 | 1.25 |
| | | Non-breeding | 1.000 (±<0.001) | 0.987 (±0.002) | 0.04 | 1.29 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| | | Annual | 0.999 (±<0.001) | 0.975 (±0.002) | 0.07 | 2.52 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.955 (±0.002) | 0.13 | 4.48 |
| | | Non-breeding | 1.000 (±<0.001) | 0.985 (±0.002) | 0.04 | 1.53 |
| | | Annual | 0.998 (±<0.001) | 0.941 (±0.002) | 0.17 | 5.94 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.927 (±0.002) | 0.21 | 7.35 |
| | | Non-breeding | 0.999 (±<0.001) | 0.954 (±0.002) | 0.13 | 4.56 |
| | | Annual | 0.997 (±<0.001) | 0.884 (±0.002) | 0.34 | 11.57 |
| All Consented developments plus Proposed Development (OWF) | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.989 (±0.002) | 0.03 | 1.10 |
| | | Non-breeding | 1.000 (±<0.001) | 0.989 (±0.002) | 0.03 | 1.05 |
| | | Annual | 0.999 (±<0.001) | 0.979 (±0.002) | 0.06 | 2.13 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.961 (±0.002) | 0.11 | 3.86 |
| | | Non-breeding | 1.000 (±<0.001) | 0.987 (±0.002) | 0.03 | 1.25 |
| | | Annual | 0.998 (±<0.001) | 0.949 (±0.002) | 0.14 | 5.06 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.937 (±0.002) | 0.18 | 6.32 |
| | | Non-breeding | 0.999 (±<0.001) | 0.963 (±0.002) | 0.10 | 3.70 |
| | | Annual | 0.997 (±<0.001) | 0.902 (±0.002) | 0.29 | 9.80 |

## 4.3 Razorbill

Table 4-2: presents the cumulative PVA results for razorbill when considering the relevant regional population estimates derived from the SMP.

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| All developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.989 (±0.017) | 0.03 | 1.13 |
| | | Non-breeding | 0.998 (±<0.001) | 0.944 (±0.010) | 0.16 | 5.57 |
| | | Annual | 0.998 (±<0.001) | 0.940 (±0.010) | 0.17 | 6.02 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.998 (±<0.001) | 0.959 (±0.017) | 0.12 | 4.09 |
| | | Non-breeding | 0.999 (±<0.001) | 0.934 (±0.010) | 0.19 | 6.63 |
| | | Annual | 0.998 (±<0.001) | 0.918 (±0.010) | 0.24 | 8.20 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.994 (±<0.001) | 0.933 (±0.017) | 0.19 | 6.73 |
| | | Non-breeding | 0.993 (±<0.001) | 0.813 (±0.010) | 0.57 | 18.67 |
| | | Annual | 0.994 (±<0.001) | 0.791 (±0.010) | 0.65 | 20.93 |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.988 (±0.017) | 0.03 | 1.17 |
| | | Non-breeding | 0.999 (±<0.001) | 0.951 (±0.010) | 0.14 | 4.95 |
| | | Annual | 0.998 (±<0.001) | 0.946 (±0.010) | 0.16 | 5.44 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.959 (±0.017) | 0.12 | 4.10 |
| | | Non-breeding | 0.998 (±<0.001) | 0.940 (±0.010) | 0.17 | 5.96 |
| | | Annual | 0.998 (±<0.001) | 0.925 (±0.010) | 0.22 | 7.48 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.933 (±0.017) | 0.19 | 6.74 |
| | | Non-breeding | 0.995 (±<0.001) | 0.832 (±0.010) | 0.51 | 16.77 |
| | | Annual | 0.994 (±<0.001) | 0.809 (±0.010) | 0.59 | 19.08 |
| All Consented developments plus Proposed Development (OWF) | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.989 (±0.017) | 0.03 | 1.09 |
| | | Non-breeding | 0.999 (±<0.001) | 0.962 (±0.010) | 0.11 | 3.76 |
| | | Annual | 0.999 (±<0.001) | 0.958 (±0.010) | 0.12 | 4.18 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.961 (±0.017) | 0.11 | 3.93 |
| | | Non-breeding | 0.999 (±<0.001) | 0.955 (±0.010) | 0.13 | 4.52 |
| | | Annual | 0.998 (±<0.001) | 0.940 (±0.010) | 0.17 | 6.02 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.935 (±0.017) | 0.19 | 6.48 |
| | | Non-breeding | 0.996 (±<0.001) | 0.870 (±0.010) | 0.38 | 12.96 |
| | | Annual | 0.995 (±<0.001) | 0.848 (±0.010) | 0.46 | 15.24 |

## 4.4 Puffin

Table 4-3 presents the cumulative PVA results for puffin when considering the relevant regional population estimates derived from the SMP.

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| **Applicant Approach** | | | | | | |
| All developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.989 (±0.007) | 0.03 | 1.09 |
| | | Non-breeding | 0.999 (±<0.001) | 0.964 (±0.012) | 0.10 | 3.56 |
| | | Annual | 0.999 (±<0.001) | 0.978 (±0.007) | 0.06 | 2.21 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.960 (±0.007) | 0.11 | 3.97 |
| | | Non-breeding | 0.999 (±<0.001) | 0.958 (±0.012) | 0.12 | 4.22 |
| | | Annual | 0.998 (±<0.001) | 0.947 (±0.007) | 0.15 | 5.27 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.935 (±0.007) | 0.19 | 6.50 |
| | | Non-breeding | 0.996 (±<0.001) | 0.878 (±0.012) | 0.36 | 12.18 |
| | | Annual | 0.997 (±<0.001) | 0.897 (±0.007) | 0.30 | 10.32 |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.990 (±0.007) | 0.03 | 0.97 |
| | | Non-breeding | 0.999 (±<0.001) | 0.973 (±0.013) | 0.08 | 2.72 |
| | | Annual | 0.999 (±<0.001) | 0.982 (±0.007) | 0.05 | 1.84 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.965 (±0.007) | 0.10 | 3.49 |
| | | Non-breeding | 0.999 (±<0.001) | 0.967 (±0.012) | 0.09 | 3.26 |
| | | Annual | 0.999 (±<0.001) | 0.955 (±0.007) | 0.13 | 4.52 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.943 (±0.007) | 0.16 | 5.73 |
| | | Non-breeding | 0.997 (±<0.001) | 0.904 (±0.012) | 0.28 | 9.57 |
| | | Annual | 0.997 (±<0.001) | 0.913 (±0.007) | 0.25 | 8.74 |
| All Consented developments plus Proposed Development (OWF) | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.993 (±0.007) | 0.02 | 0.74 |
| | | Non-breeding | 0.999 (±<0.001) | 0.975 (±0.013) | 0.07 | 2.46 |
| | | Annual | 1.000 (±<0.001) | 0.985 (±0.007) | 0.04 | 1.54 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.973 (±0.007) | 0.08 | 2.73 |
| | | Non-breeding | 0.999 (±<0.001) | 0.971 (±0.012) | 0.08 | 2.93 |
| | | Annual | 0.999 (±<0.001) | 0.964 (±0.007) | 0.10 | 3.62 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.999 (±<0.001) | 0.955 (±0.007) | 0.13 | 4.48 |
| | | Non-breeding | 0.998 (±<0.001) | 0.915 (±0.012) | 0.25 | 8.49 |
| | | Annual | 0.999 (±<0.001) | 0.928 (±0.007) | 0.21 | 7.17 |
| **Guidance Approach** | | | | | | |
| All developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.989 (±0.007) | 0.03 | 1.14 |
| | | Non-breeding | 0.999 (±<0.001) | 0.966 (±0.012) | 0.10 | 3.38 |
| | | Annual | 0.999 (±<0.001) | 0.978 (±0.007) | 0.10 | 2.20 |
| | | Breeding | 0.999 (±<0.001) | 0.959 (±0.007) | 0.12 | 4.08 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| | Guidance (60%,3%, 60%,1%) | Non-breeding | 0.999 (±<0.001) | 0.959 (±0.012) | 0.11 | 4.07 |
| | | Annual | 0.998 (±<0.001) | 0.947 (±0.007) | 0.20 | 5.30 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.933 (±0.007) | 0.19 | 6.74 |
| | | Non-breeding | 0.997 (±<0.001) | 0.883 (±0.012) | 0.34 | 11.66 |
| | | Annual | 0.997 (±<0.001) | 0.896 (±0.007) | 0.30 | 10.40 |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.990 (±0.007) | 0.03 | 1.02 |
| | | Non-breeding | 0.999 (±<0.001) | 0.974 (±0.012) | 0.07 | 2.60 |
| | | Annual | 0.999 (±<0.001) | 0.982 (±0.007) | 0.10 | 1.80 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.964 (±0.007) | 0.10 | 3.63 |
| | | Non-breeding | 0.999 (±<0.001) | 0.969 (±0.012) | 0.09 | 3.07 |
| | | Annual | 0.999 (±<0.001) | 0.954 (±0.007) | 0.10 | 4.60 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.940 (±0.007) | 0.17 | 5.98 |
| | | Non-breeding | 0.997 (±<0.001) | 0.910 (±0.012) | 0.26 | 9.04 |
| | | Annual | 0.997 (±<0.001) | 0.912 (±0.007) | 0.30 | 8.80 |
| All Consented developments plus Proposed Development (OWF) | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.992 (±0.007) | 0.02 | 0.82 |
| | | Non-breeding | 0.999 (±<0.001) | 0.977 (±0.012) | 0.06 | 2.28 |
| | | Annual | 1.000 (±<0.001) | 0.985 (±0.007) | 0.00 | 1.50 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.971 (±0.007) | 0.08 | 2.85 |
| | | Non-breeding | 0.999 (±<0.001) | 0.973 (±0.012) | 0.08 | 2.74 |
| | | Annual | 0.999 (±<0.001) | 0.963 (±0.007) | 0.10 | 3.70 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.999 (±<0.001) | 0.953 (±0.007) | 0.13 | 4.74 |
| | | Non-breeding | 0.998 (±<0.001) | 0.920 (±0.012) | 0.23 | 7.98 |
| | | Annual | 0.998 (±<0.001) | 0.928 (±0.007) | 0.20 | 7.20 |
| Note: Puffin was assessed in two different overall assessment approaches as noted by the Applicant and Guidance descriptor. Further details of this can be found in Volume 2, Chapter 6: Offshore Ornithology. | | | | | | |

## 4.5 Herring Gull

Table 4-4 presents the cumulative PVA results for herring gull when considering the relevant regional population estimates derived from the SMP after 35 years.

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| All developments | Guidance | Breeding | 1.000 (±0.001) | 1.000 (±0.023) | <0.001 | <0.001 |
| | | Non-breeding | 1.000 (±0.001) | 1.000 (±0.007) | <0.001 | <0.001 |
| | | Annual | 1.000 (±0.001) | 1.000 (±0.007) | <0.001 | 0.023 |
| All developments excluding Berwick Bank | Guidance | Breeding | 1.000 (±0.001) | 1.000 (±0.024) | <0.001 | <0.001 |
| | | Non-breeding | 1.000 (±0.001) | 1.000 (±0.007) | <0.001 | <0.001 |
| | | Annual | 1.000 (±0.001) | 1.000 (±0.007) | <0.001 | 0.020 |
| All Consented developments plus Proposed Development (OWF) | Guidance | Breeding | 1.000 (±0.001) | 1.000 (±0.024) | <0.001 | <0.001 |
| | | Non-breeding | 1.000 (±0.001) | 1.000 (±0.007) | <0.001 | 0.029 |
| | | Annual | 1.000 (±0.001) | 1.000 (±0.007) | <0.001 | 0.007 |

## 4.6 Greater black-backed Gull

Table 4-5 presents the cumulative PVA results for greater black-backed gull when considering the relevant regional population estimates derived from the SMP after 35 years.

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| All developments | Guidance | Breeding | - | - | - | - |
| | | Non-breeding | 0.986 (±<0.001) | 0.592 (±0.006) | 1.448 | 40.846 |
| | | Annual | 0.985 (±<0.001) | 0.575 (±0.006) | 1.523 | 42.455 |
| All developments excluding Berwick Bank | Guidance | Breeding | - | - | - | - |
| | | Non-breeding | 0.986 (±<0.001) | 0.592 (±0.006) | 1.447 | 40.836 |
| | | Annual | 0.985 (±<0.001) | 0.575 (±0.006) | 1.523 | 42.471 |
| All Consented developments plus Proposed Development (OWF) | Guidance | Breeding | - | - | - | - |
| | | Non-breeding | 0.986 (±<0.001) | 0.601 (±0.006) | 1.404 | 39.889 |
| | | Annual | 0.985 (±<0.001) | 0.585 (±0.006) | 1.480 | 41.535 |

Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold or weren't ran as the Proposed Development had zero contribution to impacts.

## 4.7 Kittiwake

Table 4-6 presents the cumulative PVA results for kittiwake when considering the relevant regional population estimates derived from the SMP.

| Impact type | Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|---|
| Disp. | All developments | Applicant (30%,1%) | Breeding | 1.000 (±<0.001) | 0.986 (±0.006) | 0.04 | 1.36 |
| | | | Non-breeding | - | - | - | - |
| | | | Annual | 1.000 (±<0.001) | 0.986 (±0.005) | 0.04 | 1.44 |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.999 (±<0.001) | 0.960 (±0.006) | 0.11 | 3.98 |
| | | | Non-breeding | 0.999 (±<0.001) | 0.981 (±0.005) | 0.05 | 1.86 |
| | | | Annual | 0.999 (±<0.001) | 0.958 (0.004) | 0.12 | 4.22 |
| | All developments excluding Berwick Bank | Applicant (30%,1%) | Breeding | 1.000 (±<0.001) | 0.992 (±0.006) | 0.02 | 0.83 |
| | | | Non-breeding | - | - | - | - |
| | | | Annual | - | - | - | - |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.999 (±<0.001) | 0.976 (±0.006) | 0.07 | 2.40 |
| | | | Non-breeding | - | - | - | - |
| | | | Annual | 0.999 (±<0.001) | 0.978 (±0.004) | 0.06 | 2.16 |
| | All Consented developments plus Proposed Development (OWF) | Applicant (30%,1%) | Breeding | - | - | - | - |
| | | | Non-breeding | - | - | - | - |
| | | | Annual | - | - | - | - |
| | | | Breeding | 0.999 (±<0.001) | 0.982 (±0.006) | 0.05 | 1.81 |

| Impact type | Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|---|
| | | Guidance (30%,3%, 30%,1%) | Non-breeding | - | - | - | - |
| | | | Annual | 1.000 (±<0.001) | 0.983 (±0.005) | 0.05 | 1.69 |
| Collision | All developments | Guidance | Breeding | 0.998 (±<0.001) | 0.934 (±0.006) | 0.19 | 6.60 |
| | | | Non-breeding | 0.999 (±<0.001) | 0.913 (±0.004) | 0.25 | 8.67 |
| | | | Annual | 0.999 (±<0.001) | 0.877 (±0.004) | 0.37 | 12.33 |
| | All developments excluding Berwick Bank | Guidance | Breeding | 0.996 (±<0.001) | 0.967 (±0.006) | 0.09 | 3.35 |
| | | | Non-breeding | 0.999 (±<0.001) | 0.925 (±0.004) | 0.22 | 7.54 |
| | | | Annual | 0.997 (±<0.001) | 0.906 (±0.004) | 0.27 | 9.41 |
| | All Consented developments plus Proposed Development (OWF) | Guidance | Breeding | 0.999 (±<0.001) | 0.975 (±0.006) | 0.07 | 2.53 |
| | | | Non-breeding | 0.999 (±<0.001) | 0.943 (±0.004) | 0.16 | 5.73 |
| | | | Annual | 0.998 (±<0.001) | 0.929 (±0.004) | 0.21 | 7.14 |
| Combined | All developments | Applicant (30%,1%) | Breeding | 0.998 (±<0.001) | 0.921 (±0.006) | 0.227 | 7.876 |
| | | | Non-breeding | 0.998 (±<0.001) | 0.908 (±0.004) | 0.269 | 9.232 |
| | | | Annual | 0.996 (±<0.001) | 0.864 (±0.004) | 0.404 | 13.576 |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.997 (±<0.001) | 0.897 (±0.005) | 0.302 | 10.315 |
| | | | Non-breeding | 0.998 (±<0.001) | 0.896 (±0.004) | 0.304 | 10.385 |
| | | | Annual | 0.995 (±<0.001) | 0.839 (±0.004) | 0.485 | 16.051 |

| Impact type | Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|---|
| | All developments excluding Berwick Bank | Applicant (30%,1%) | Breeding | 0.999 (±<0.001) | 0.959 (±0.006) | 0.117 | 4.147 |
| | | | Non-breeding | 0.998 (±<0.001) | 0.922 (±0.004) | 0.225 | 7.783 |
| | | | Annual | 0.997 (±<0.001) | 0.899 (±0.004) | 0.294 | 10.079 |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.998 (±<0.001) | 0.943 (±0.006) | 0.162 | 5.668 |
| | | | Non-breeding | 0.998 (±<0.001) | 0.918 (±0.004) | 0.238 | 8.214 |
| | | | Annual | 0.997 (±<0.001) | 0.886 (±0.004) | 0.335 | 11.382 |
| | All Consented developments plus Proposed Development (OWF) | Applicant (30%,1%) | Breeding | 0.999 (±<0.001) | 0.969 (±0.006) | 0.088 | 3.118 |
| | | | Non-breeding | 0.998 (±<0.001) | 0.941 (±0.004) | 0.169 | 5.914 |
| | | | Annual | 0.998 (±<0.001) | 0.923 (±0.004) | 0.221 | 7.673 |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.999 (±<0.001) | 0.957 (±0.006) | 0.121 | 4.266 |
| | | | Non-breeding | 0.998 (±<0.001) | 0.937 (±0.004) | 0.181 | 6.310 |
| | | | Annual | 0.997 (±<0.001) | 0.913 (±0.004) | 0.253 | 8.723 |

Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold.

## 4.8 Gannet

Table 4-7 presents the cumulative PVA results for gannet when considering the relevant regional population estimates derived from the SMP after 35 years.

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| **Applicant Approach** | | | | | | |
| All developments | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.962 (±0.004) | 0.11 | 3.80 |
| | | Non-breeding | 0.998 (±<0.001) | 0.925 (±0.004) | 0.22 | 7.53 |
| | | Annual | 0.998 (±<0.001) | 0.925 (±0.004) | 0.22 | 7.48 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.998 (±<0.001) | 0.946 (±0.004) | 0.16 | 5.45 |
| | | Non-breeding | 0.997 (±<0.001) | 0.882 (±0.004) | 0.35 | 11.82 |
| | | Annual | 0.997 (±<0.001) | 0.888 (±0.004) | 0.33 | 11.16 |
| All developments excluding Berwick Bank | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.963 (±0.004) | 0.10 | 3.66 |
| | | Non-breeding | 0.998 (±<0.001) | 0.926 (±0.004) | 0.21 | 7.36 |
| | | Annual | 0.998 (±<0.001) | 0.928 (±0.004) | 0.21 | 7.25 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.950 (±0.004) | 0.14 | 5.01 |
| | | Non-breeding | 0.997 (±<0.001) | 0.887 (±0.004) | 0.33 | 11.64 |
| | | Annual | 0.997 (±<0.001) | 0.885 (±0.004) | 0.31 | 10.51 |
| All Consented developments plus Proposed Development (OWF) | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.968 (±0.004) | 0.09 | 3.20 |
| | | Non-breeding | 0.998 (±<0.001) | 0.937 (±0.004) | 0.18 | 6.43 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| | | Annual | 0.998 (±<0.001) | 0.937 (±0.004) | 0.18 | 6.26 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.957 (±0.004) | 0.12 | 4.28 |
| | | Non-breeding | 0.997 (±<0.001) | 0.904 (±0.004) | 0.28 | 9.84 |
| | | Annual | 0.997 (±<0.001) | 0.910 (±0.004) | 0.26 | 8.95 |
| **Guidance Approach** | | | | | | |
| All developments | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.961 (±0.004) | 0.109 | 3.854 |
| | | Non-breeding | 0.998 (±<0.001) | 0.925 (±0.005) | 0.217 | 7.535 |
| | | Annual | 0.998 (±<0.001) | 0.925 (±0.005) | 0.217 | 7.515 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.998 (±<0.001) | 0.945 (±0.004) | 0.157 | 5.490 |
| | | Non-breeding | 0.997 (±<0.001) | 0.882 (±0.004) | 0.348 | 11.823 |
| | | Annual | 0.997 (±<0.001) | 0.888 (±0.004) | 0.329 | 11.194 |
| All developments excluding Berwick Bank | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.963 (±0.004) | 0.104 | 3.699 |
| | | Non-breeding | 0.998 (±<0.001) | 0.926 (±0.004) | 0.212 | 7.362 |
| | | Annual | 0.998 (±<0.001) | 0.927 (±0.004) | 0.210 | 7.285 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.950 (±0.004) | 0.144 | 5.043 |
| | | Non-breeding | 0.997 (±<0.001) | 0.886 (±0.004) | 0.334 | 11.355 |
| | | Annual | 0.997 (±<0.001) | 0.894 (±0.004) | 0.309 | 10.556 |

| Cumulative scenario | Scenario | Season | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
|---|---|---|---|---|---|---|
| All Consented developments plus Proposed Development (OWF) | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.968 (±0.004) | 0.091 | 3.244 |
| | | Non-breeding | 0.998 (±<0.001) | 0.938 (±0.004) | 0.179 | 6.246 |
| | | Annual | 0.998 (±<0.001) | 0.937 (±0.004) | 0.180 | 6.288 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.957 (±0.004) | 0.123 | 4.330 |
| | | Non-breeding | 0.997 (±<0.001) | 0.904 (±0.004) | 0.280 | 9.592 |
| | | Annual | 0.997 (±<0.001) | 0.910 (±0.004) | 0.261 | 8.979 |

# 5 PVA Outputs for 25 and 50 Years

5.1.1.1 This sections provides the species-specific 25-year and 50-year outputs for the EIA PVA analysis.

Table 5-1: Cumulative PVA results for guillemot when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.990 (±0.002) | 0.04 | 0.91 | 0.999 (±<0.001) | 0.982 (±0.002) | 0.03 | 1.77 |
| | | Non-breeding | 1.000 (±<0.001) | 0.991 (±0.002) | 0.04 | 0.93 | 1.000 (±<0.001) | 0.981 (±0.002) | 0.04 | 1.82 |
| | | Annual | 0.999 (±<0.001) | 0.982 (±0.002) | 0.07 | 1.83 | 0.999 (±<0.001) | 0.964 (±0.002) | 0.07 | 3.56 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 1.000 (±<0.001) | 0.967 (±0.002) | 0.13 | 3.26 | 0.999 (±<0.001) | 0.937 (±0.002) | 0.13 | 6.29 |
| | | Non-breeding | 1.000 (±<0.001) | 0.989 (±0.002) | 0.04 | 1.11 | 1.000 (±<0.001) | 0.978 (±0.002) | 0.04 | 2.16 |
| | | Annual | 0.998 (±<0.001) | 0.957 (±0.002) | 0.17 | 4.33 | 0.998 (±<0.001) | 0.917 (±0.002) | 0.17 | 8.32 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.946 (±0.002) | 0.21 | 5.36 | 0.998 (±<0.001) | 0.898 (±0.002) | 0.21 | 10.24 |
| | | Non-breeding | 0.999 (±<0.001) | 0.967 (±0.002) | 0.13 | 3.31 | 0.999 (±<0.001) | 0.936 (±0.002) | 0.13 | 6.40 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | | Annual | 0.997 (±<0.001) | 0.915 (±0.002) | 0.34 | 8.50 | 0.997 (±<0.001) | 0.840 (±0.002) | 0.34 | 15.99 |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 0.999 (±<0.001) | 0.991 (±0.002) | 0.03 | 0.90 | 0.999 (±<0.001) | 0.982 (±0.002) | 0.03 | 1.76 |
| | | Non-breeding | 1.000 (±<0.001) | 0.991 (±0.002) | 0.04 | 0.93 | 1.000 (±<0.001) | 0.982 (±0.002) | 0.04 | 1.82 |
| | | Annual | 0.999 (±<0.001) | 0.982 (±0.002) | 0.07 | 1.83 | 0.999 (±<0.001) | 0.964 (±0.002) | 0.07 | 3.55 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.967 (±0.002) | 0.13 | 3.25 | 0.999 (±<0.001) | 0.937 (±0.002) | 0.13 | 6.28 |
| | | Non-breeding | 1.000 (±<0.001) | 0.989 (±0.002) | 0.04 | 1.11 | 1.000 (±<0.001) | 0.978 (±0.002) | 0.04 | 2.16 |
| | | Annual | 0.998 (±<0.001) | 0.957 (±0.002) | 0.17 | 4.33 | 0.998 (±<0.001) | 0.917 (±0.002) | 0.17 | 8.31 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.946 (±0.002) | 0.21 | 5.36 | 0.998 (±<0.001) | 0.897 (±0.002) | 0.21 | 10.24 |
| | | Non-breeding | 0.999 (±<0.001) | 0.967 (±0.002) | 0.13 | 3.31 | 0.999 (±<0.001) | 0.936 (±0.002) | 0.13 | 6.39 |
| | | Annual | 0.997 (±<0.001) | 0.915 (±0.002) | 0.34 | 8.51 | 0.997 (±<0.001) | 0.840 (±0.002) | 0.34 | 15.99 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All Consented developments plus Proposed Development (OWF) | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.992 (±0.002) | 0.03 | 0.79 | 1.000 (±<0.001 | 0.985 (±0.002) | 0.03 | 1.55 |
| | | Non-breeding | 1.000 (±<0.001) | 0.992 (±0.002) | 0.03 | 0.76 | 1.000 (±<0.001) | 0.985 (±0.002) | 0.03 | 1.49 |
| | | Annual | 0.999 (±<0.001) | 0.985 (±0.002) | 0.06 | 1.54 | 0.999 (±<0.001) | 0.970 (±0.002) | 0.06 | 3.00 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.971 (±0.002) | 0.11 | 2.80 | 0.999 (±<0.001 | 0.945 (±0.002) | 0.11 | 5.42 |
| | | Non-breeding | 1.000 (±<0.001) | 0.991 (±0.002) | 0.03 | 0.91 | 1.000 (±<0.001) | 0.982 (±0.002) | 0.03 | 1.77 |
| | | Annual | 0.998 (±<0.001) | 0.963 (±0.002) | 0.14 | 3.68 | 0.998 (±<0.001) | 0.929 (±0.002) | 0.14 | 7.09 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.954 (±0.002) | 0.18 | 4.61 | 0.998 (±<0.001) | 0.912 (±0.002) | 0.18 | 8.84 |
| | | Non-breeding | 0.999 (±<0.001) | 0.973 (±0.002) | 0.10 | 2.69 | 0.998 (±<0.001) | 0.948 (±0.002) | 0.10 | 5.20 |
| | | Annual | 0.997 (±<0.001) | 0.928 (±0.002) | 0.29 | 7.17 | 0.997 (±<0.001) | 0.864 (±0.002) | 0.29 | 13.59 |

Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold or where there was no contribution from the Proposed Development.

Table 5-2: Cumulative PVA results for razorbill when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All developments | Applicant (50%,1%) | Breeding | 0.999 (±<0.001) | 0.992 (±0.013) | 0.03 | 0.81 | 0.999 (±<0.001) | 0.983 (±0.024) | 0.03 | 1.62 |
| | | Non-breeding | 0.998 (±<0.001) | 0.959 (±0.008) | 0.16 | 4.06 | 0.998 (±<0.001) | 0.922 (±0.014) | 0.16 | 7.79 |
| | | Annual | 0.998 (±<0.001) | 0.956 (±0.008) | 0.17 | 4.38 | 0.998 (±<0.001) | 0.916 (±0.014) | 0.17 | 8.40 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.970 (±0.013) | 0.12 | 2.99 | 0.999 (±<0.001) | 0.943 (±0.023) | 0.12 | 5.74 |
| | | Non-breeding | 0.998 (±<0.001) | 0.951 (±0.008) | 0.19 | 4.85 | 0.998 (±<0.001) | 0.907 (±0.014) | 0.19 | 9.26 |
| | | Annual | 0.998 (±<0.001) | 0.940 (±0.008) | 0.24 | 6.00 | 0.998 (±<0.001) | 0.886 (±0.014) | 0.24 | 11.40 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.951 (±0.013) | 0.19 | 4.94 | 0.998 (±<0.001) | 0.906 (±0.022) | 0.19 | 9.42 |
| | | Non-breeding | 0.994 (±<0.001) | 0.861 (±0.008) | 0.57 | 13.87 | 0.994 (±<0.001) | 0.746 (±0.012) | 0.57 | 25.39 |
| | | Annual | 0.994 (±<0.001) | 0.843 (±0.008) | 0.65 | 15.61 | 0.993 (±<0.001) | 0.717 (±0.012) | 0.65 | 28.32 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 0.999 (±<0.001) | 0.992 (±0.013) | 0.03 | 0.83 | 0.999 (±<0.001) | 0.984 (±0.024) | 0.03 | 1.64 |
| | | Non-breeding | 0.998 (±<0.001) | 0.963 (±0.008) | 0.14 | 3.60 | 0.999 (±<0.001) | 0.930 (±0.014) | 0.14 | 6.93 |
| | | Annual | 0.998 (±<0.001) | 0.961 (±0.008) | 0.15 | 3.93 | 0.998 (±<0.001) | 0.924 (±0.014) | 0.15 | 7.58 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.970 (±0.013) | 0.12 | 2.99 | 0.999 (±<0.001) | 0.942 (±0.023) | 0.12 | 5.78 |
| | | Non-breeding | 0.998 (±<0.001) | 0.957 (±0.008) | 0.17 | 4.33 | 0.998 (±<0.001) | 0.917 (±0.014) | 0.17 | 8.32 |
| | | Annual | 0.998 (±<0.001) | 0.946 (±0.008) | 0.22 | 5.45 | 0.998 (±<0.001) | 0.896 (±0.014) | 0.22 | 10.44 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.951 (±0.013) | 0.19 | 4.92 | 0.998 (±<0.001) | 0.906 (±0.022) | 0.19 | 9.43 |
| | | Non-breeding | 0.995 (±<0.001) | 0.875 (±0.008) | 0.51 | 12.43 | 0.995 (±<0.001) | 0.771 (±0.014) | 0.51 | 22.90 |
| | | Annual | 0.994 (±<0.001) | 0.858 (±0.008) | 0.59 | 14.20 | 0.994 (±<0.001) | 0.741 (±0.014) | 0.59 | 25.91 |
| All Consented developments | Applicant (50%,1%) | Breeding | 0.999 (±<0.001) | 0.992 (±0.013) | 0.03 | 0.79 | 0.999 (±<0.001) | 0.985 (±0.023) | 0.03 | 1.51 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| plus Proposed Development (OWF) | | Non-breeding | 0.998 (±<0.001) | 0.973 (±0.008) | 0.11 | 2.73 | 0.999 (±<0.001) | 0.947 (±0.014) | 0.11 | 5.30 |
| | | Annual | 0.999 (±<0.001) | 0.970 (±0.008) | 0.12 | 3.04 | 0.999 (±<0.001) | 0.941 (±0.014) | 0.12 | 5.89 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.971 (±0.013) | 0.11 | 2.85 | 0.999 (±<0.001) | 0.944 (±0.023) | 0.11 | 5.57 |
| | | Non-breeding | 0.998 (±<0.001) | 0.967 (±0.008) | 0.13 | 3.29 | 0.999 (±<0.001) | 0.937 (±0.014) | 0.13 | 6.33 |
| | | Annual | 0.998 (±<0.001) | 0.956 (±0.008) | 0.17 | 4.38 | 0.998 (±<0.001) | 0.916 (±0.014) | 0.17 | 8.42 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.953 (±0.013) | 0.18 | 4.70 | 0.998 (±<0.001) | 0.910 (±0.022) | 0.19 | 9.04 |
| | | Non-breeding | 0.996 (±<0.001) | 0.904 (±0.008) | 0.38 | 9.53 | 0.996 (±<0.001) | 0.821 (±0.014) | 0.38 | 17.85 |
| | | Annual | 0.995 (±<0.001) | 0.887 (±0.008) | 0.46 | 11.28 | 0.995 (±<0.001) | 0.790 (±0.014) | 0.46 | 20.92 |

Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold or where there was no contribution from the Proposed Development.

Table 5-3: Cumulative PVA results for puffin when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| **Applicant** | | | | | | | | | | |
| All developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.992 (±0.006) | 0.03 | 0.78 | 1.000 (±<0.001) | 0.985 (±0.009) | 0.03 | 1.54 |
| | | Non-breeding | 0.999 (±<0.001) | 0.974 (±0.010) | 0.10 | 2.58 | 0.999 (±<0.001) | 0.950 (±0.016) | 0.10 | 5.00 |
| | | Annual | 0.999 (±<0.001) | 0.984 (±0.006) | 0.06 | 1.60 | 0.999 (±<0.001) | 0.969 (±0.009) | 0.06 | 3.14 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.971 (±0.006) | 0.11 | 2.88 | 0.999 (±<0.001) | 0.944 (±0.009) | 0.11 | 5.57 |
| | | Non-breeding | 0.999 (±<0.001) | 0.969 (±0.010) | 0.12 | 3.06 | 0.999 (±<0.001) | 0.941 (±0.016) | 0.12 | 5.94 |
| | | Annual | 0.998 (±<0.001) | 0.962 (±0.006) | 0.15 | 3.84 | 0.998 (±<0.001) | 0.926 (±0.008) | 0.15 | 7.37 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.953 (±0.006) | 0.19 | 4.73 | 0.998 (±<0.001) | 0.909 (±0.009) | 0.19 | 9.08 |
| | | Non-breeding | 0.996 (±<0.001) | 0.911 (±0.010) | 0.36 | 8.93 | 0.996 (±<0.001) | 0.832 (±0.016) | 0.36 | 16.80 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | | Annual | 0.997 (±<0.001) | 0.924 (±0.006) | 0.30 | 7.57 | 0.997 (±<0.001) | 0.857 (±0.008) | 0.30 | 14.32 |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.993 (±0.006) | 0.03 | 0.69 | 1.000 (±<0.001) | 0.986 (±0.009) | 0.03 | 1.38 |
| | | Non-breeding | 0.999 (±<0.001) | 0.980 (±0.010) | 0.08 | 1.95 | 0.999 (±<0.001) | 0.962 (±0.016) | 0.08 | 3.84 |
| | | Annual | 0.999 (±<0.001) | 0.987 (±0.006) | 0.05 | 1.33 | 0.999 (±<0.001) | 0.974 (±0.009) | 0.05 | 2.62 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.975 (±0.006) | 0.10 | 2.55 | 0.999 (±<0.001) | 0.951 (±0.009) | 0.10 | 4.93 |
| | | Non-breeding | 0.999 (±<0.001) | 0.976 (±0.010) | 0.09 | 2.37 | 0.999 (±<0.001) | 0.954 (±0.016) | 0.09 | 4.61 |
| | | Annual | 0.999 (±<0.001) | 0.967 (±0.006) | 0.13 | 3.27 | 0.999 (±<0.001) | 0.937 (±0.009) | 0.13 | 6.34 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.999 (±<0.001) | 0.958 (±0.006) | 0.16 | 4.18 | 0.998 (±<0.001) | 0.919 (±0.009) | 0.16 | 8.05 |
| | | Non-breeding | 0.997 (±<0.001) | 0.930 (±0.010) | 0.28 | 6.99 | 0.997 (±<0.001) | 0.867 (±0.016) | 0.28 | 13.26 |
| | | Annual | 0.997 (±<0.001) | 0.936 (±0.006) | 0.25 | 6.39 | 0.997 (±<0.001) | 0.878 (±0.008) | 0.25 | 12.18 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All Consented developments plus Proposed Development (OWF) | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.995 (±0.006) | 0.02 | 0.53 | 1.000 (±<0.001) | 0.989 (±0.009) | 0.02 | 1.06 |
| | | Non-breeding | 0.997 (±<0.001) | 0.982 (±0.010) | 0.07 | 1.76 | 0.999 (±<0.001) | 0.965 (±0.016) | 0.07 | 3.47 |
| | | Annual | 1.000 (±<0.001) | 0.989 (±0.006) | 0.04 | 1.12 | 1.000 (±<0.001) | 0.978 (±0.009) | 0.04 | 2.20 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.980 (±0.006) | 0.08 | 1.98 | 0.999 (±<0.001) | 0.962 (±0.009) | 0.08 | 3.83 |
| | | Non-breeding | 0.999 (±<0.001) | 0.979 (±0.010) | 0.08 | 2.11 | 0.999 (±<0.001) | 0.959 (±0.016) | 0.08 | 4.12 |
| | | Annual | 0.999 (±<0.001) | 0.974 (±0.006) | 0.10 | 2.63 | 0.999 (±<0.001) | 0.949 (±0.009) | 0.10 | 5.11 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.999 (±<0.001) | 0.968 (±0.006) | 0.13 | 3.25 | 0.999 (±<0.001) | 0.937 (±0.009) | 0.13 | 6.32 |
| | | Non-breeding | 0.998 (±<0.001) | 0.938 (±0.010) | 0.25 | 6.20 | 0.998 (±<0.001) | 0.882 (±0.016) | 0.25 | 11.81 |
| | | Annual | 0.998 (±<0.001) | 0.948 (±0.006) | 0.21 | 5.23 | 0.998 (±<0.001) | 0.900 (±0.009) | 0.21 | 10.01 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| **Guidance** | | | | | | | | | | |
| All developments | | Breeding | 1.000 (±<0.001) | 0.992 (±0.006) | 0.03 | 0.84 | 1.000 (±<0.001) | 0.984 (±0.009) | 0.03 | 1.62 |
| | Applicant (50%,1%) | Non-breeding | 0.999 (±<0.001) | 0.976 (±0.010) | 0.09 | 2.44 | 0.999 (±<0.001) | 0.952 (±0.016) | 0.10 | 4.80 |
| | | Annual | 0.999 (±<0.001) | 0.984 (±0.006) | 0.06 | 1.60 | 0.999 (±<0.001) | 0.969 (±0.009) | 0.06 | 3.14 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.970 (±0.006) | 0.12 | 2.96 | 0.999 (±<0.001) | 0.943 (±0.009) | 0.12 | 5.74 |
| | | Non-breeding | 0.999 (±<0.001) | 0.970 (±0.010) | 0.11 | 2.96 | 0.999 (±<0.001) | 0.943 (±0.015) | 0.12 | 5.73 |
| | | Annual | 0.998 (±<0.001) | 0.961 (±0.006) | 0.15 | 3.89 | 0.998 (±<0.001) | 0.925 (±0.009) | 0.15 | 0.15 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.951 (±0.006) | 0.19 | 4.92 | 0.998 (±<0.001) | 0.906 (±0.009) | 0.19 | 9.42 |
| | | Non-breeding | 0.997 (±<0.001) | 0.914 (±0.010) | 0.34 | 8.58 | 0.997 (±<0.001) | 0.839 (±0.015) | 0.34 | 16.12 |
| | | Annual | 0.997 (±<0.001) | 0.924 (±0.006) | 0.30 | 7.59 | 0.997 (±<0.001) | 0.857 (±0.009) | 0.30 | 14.35 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All developments excluding Berwick Bank | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.993 (±0.006) | 0.03 | 0.74 | 1.000 (±<0.001) | 0.986 (±0.009) | 0.03 | 1.45 |
| | | Non-breeding | 0.999 (±<0.001) | 0.981 (±0.010) | 0.07 | 1.89 | 0.999 (±<0.001) | 0.963 (±0.015) | 0.07 | 3.66 |
| | | Annual | 0.999 (±<0.001) | 0.987 (±0.006) | 0.05 | 1.33 | 0.999 (±<0.001) | 0.974 (±0.009) | 0.05 | 2.60 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.974 (±0.006) | 0.10 | 2.64 | 0.999 (±<0.001) | 0.949 (±0.009) | 0.10 | 5.12 |
| | | Non-breeding | 0.999 (±<0.001) | 0.978 (±0.010) | 0.09 | 2.23 | 0.999 (±<0.001) | 0.956 (±0.015) | 0.09 | 4.35 |
| | | Annual | 0.999 (±<0.001) | 0.966 (±0.006) | 0.13 | 3.36 | 0.999 (±<0.001) | 0.935 (±0.009) | 0.13 | 6.47 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.998 (±<0.001) | 0.956 (±0.006) | 0.17 | 4.36 | 0.998 (±<0.001) | 0.916 (±0.009) | 0.17 | 8.38 |
| | | Non-breeding | 0.997 (±<0.001) | 0.934 (±0.010) | 0.26 | 6.59 | 0.997 (±<0.001) | 0.874 (±0.015) | 0.26 | 12.59 |
| | | Annual | 0.997 (±<0.001) | 0.936 (±0.006) | 0.25 | 6.41 | 0.997 (±<0.001) | 0.878 (±0.009) | 0.26 | 12.24 |
| All Consented developments | Applicant (50%,1%) | Breeding | 1.000 (±<0.001) | 0.994 (±0.006) | 0.02 | 0.58 | 1.000 (±<0.001) | 0.988 (±0.009) | 0.02 | 1.17 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| plus Proposed Development (OWF) | | Non-breeding | 0.999 (±<0.001) | 0.984 (±0.010) | 0.06 | 1.65 | 0.999 (±<0.001) | 0.968 (±0.015) | 0.06 | 3.21 |
| | | Annual | 1.000 (±<0.001) | 0.989 (±0.006) | 0.04 | 1.09 | 1.000 (±<0.001) | 0.978 (±0.009) | 0.04 | 2.16 |
| | Guidance (60%,3%, 60%,1%) | Breeding | 0.999 (±<0.001) | 0.979 (±0.006) | 0.08 | 2.08 | 0.999 (±<0.001) | 0.960 (±0.009) | 0.08 | 4.02 |
| | | Non-breeding | 0.999 (±<0.001) | 0.980 (±0.010) | 0.08 | 1.98 | 0.999 (±<0.001) | 0.961 (±0.015) | 0.08 | 3.88 |
| | | Annual | 0.999 (±<0.001) | 0.973 (±0.006) | 0.11 | 2.70 | 0.999 (±<0.001) | 0.948 (±0.009) | 0.11 | 5.24 |
| | Guidance (60%,5%, 60%,3%) | Breeding | 0.999 (±<0.001) | 0.966 (±0.006) | 0.13 | 3.43 | 0.999 (±<0.001) | 0.960 (±0.009) | 0.13 | 6.63 |
| | | Non-breeding | 0.998 (±<0.001) | 0.942 (±0.010) | 0.23 | 5.82 | 0.998 (±<0.001) | 0.889 (±0.015) | 0.23 | 11.14 |
| | | Annual | 0.998 (±<0.001) | 0.947 (±0.006) | 0.21 | 5.28 | 0.998 (±<0.001) | 0.899 (±0.009) | 0.21 | 10.08 |

Table 5-4: Cumulative PVA results for herring gull when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All developments | Guidance | Breeding | 1.000 (±<0.001) | 1.000 (±0.021) | <0.001 | <0.001 | 1.000 (±<0.001) | 1.000 (±0.026) | <0.001 | <0.001 |
| | | Non-breeding | 1.000 (±<0.001) | 1.000 (±0.006) | 0.000 | <0.001 | 1.000 (±<0.001) | 1.000 (±<0.008) | 0.000 | <0.001 |
| | | Annual | 1.000 (±<0.001) | 1.000 (±0.006) | 0.000 | 0.017 | 1.000 (±<0.001) | 1.000 (±<0.008) | 0.000 | 0.006 |
| All developments excluding Berwick Bank | Guidance | Breeding | 1.000 (±<0.001) | 1.000 (±0.006) | <0.001 | <0.001 | 1.000 (±<0.001) | 1.000 (±0.026) | <0.001 | <0.001 |
| | | Non-breeding | 1.000 (±<0.001) | 1.000 (±0.006) | 0.000 | <0.001 | 1.000 (±<0.001) | 1.000 (±<0.008) | 0.000 | <0.001 |
| | | Annual | 1.000 (±<0.001) | 1.000 (±0.006) | 0.000 | 0.022 | 1.000 (±<0.001) | 1.000 (±<0.008) | 0.000 | 0.022 |
| All Consented developments plus Proposed Development (OWF) | Guidance | Breeding | 1.000 (±<0.001) | 1.000 (±0.006) | <0.001 | <0.001 | 1.000 (±<0.001) | 1.000 (±0.026) | <0.001 | <0.001 |
| | | Non-breeding | 1.000 (±<0.001) | 1.000 (±0.006) | 0.000 | <0.001 | 1.000 (±<0.001) | 1.000 (±<0.008) | <0.001 | 0.011 |
| | | Annual | 1.000 (±<0.001) | 1.000 (±0.006) | 0.000 | 0.009 | 1.000 (±<0.001) | 1.000 (±<0.008) | <0.001 | <0.001 |

Table 5-5: Cumulative PVA results for greater black-backed gull when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| All developments | Guidance | Breeding | - | - | - | - | - | - | - | - |
| | | Non-breeding | 0.986 (±<0.001) | 0.684 (±0.006) | 1.448 | 31.550 | 0.986 (±<0.001) | 0.475 (±0.004) | 1.448 | 52.471 |
| | | Annual | 0.985 (±<0.001) | 0.671 (±0.006) | 1.523 | 32.906 | 0.985 (±<0.001) | 0.457 (±0.004) | 1.524 | 54.295 |
| All developments excluding Berwick Bank | Guidance | Breeding | - | - | - | - | - | - | - | - |
| | | Non-breeding | 0.986 (±<0.001) | 0.685 (±0.006) | 1.447 | 31.548 | 0.986 (±<0.001) | 0.475 (±0.004) | 1.447 | 52.463 |
| | | Annual | 0.985 (±<0.001) | 0.670 (±0.006) | 1.524 | 32.922 | 0.985 (±<0.001) | 0.457 (±0.004) | 1.523 | 54.305 |
| All Consented developments plus Proposed Development (OWF) | Guidance | Breeding | - | - | - | - | - | - | - | - |
| | | Non-breeding | 0.986 (±<0.001) | 0.692 (±0.006) | 1.404 | 30.766 | 0.986 (±<0.001) | 0.486 (±0.004) | 1.404 | 51.380 |
| | | Annual | 0.985 (±<0.001) | 0.679 (±0.006) | 1.480 | 32.130 | 0.985 (±<0.001) | 0.467 (±0.004) | 1.480 | 53.262 |

Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold or where there was no contribution from the Proposed Development.

Table 5-6: Cumulative PVA results for kittiwake when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Impact type | Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| Disp. | All developments | Applicant (30%,1%) | Breeding | 0.999 ±<0.001 | 0.990 ±0.005 | 0.04 | 1.00 | 0.999 ±<0.001 | 0.980 ± 0.006 | 0.04 | 1.93 |
| | | | Non-breeding | - | - | - | - | - | - | - | - |
| | | | Annual | - | - | - | - | - | - | - | - |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.999 ±<0.001 | 0.971 ±0.005 | 0.11 | 2.90 | 0.999 ±<0.001 | 0.944 ± 0.006 | 0.11 | 5.59 |
| | | | Non-breeding | - | - | - | - | - | - | - | - |
| | | | Annual | - | - | - | - | - | - | - | - |
| | All developments excluding Berwick Bank | Applicant (30%,1%) | Breeding | 0.999 ±<0.001 | 0.994 ±0.005 | 0.02 | 0.61 | 0.999 ±<0.001 | 0.989 ± 0.006 | 0.02 | 1.15 |
| | | | Non-breeding | - | - | - | - | - | - | - | - |
| | | | Annual | - | - | - | - | - | - | - | - |
| | | | Breeding | 0.999 ±<0.001 | 0.983 ±0.005 | 0.07 | 1.73 | 0.999 ±<0.001 | 0.966 ± 0.006 | 0.07 | 3.38 |

| Impact type | Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | | Guidance (30%,3%, 30%,1%) | Non-breeding | - | - | - | - | - | - | - | - |
| | | | Annual | - | - | - | - | - | - | - | - |
| | All Consented developments plus Proposed Development (OWF) | Applicant (30%,1%) | Breeding | - | - | - | - | - | - | - | - |
| | | | Non-breeding | - | - | - | - | - | - | - | - |
| | | | Annual | - | - | - | - | - | - | - | - |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.999 ±<0.001 | 0.987 ±0.005 | 0.05 | 1.33 | 0.999 ±<0.001 | 0.974 ± 0.006 | 0.05 | 2.56 |
| | | | Non-breeding | - | - | - | - | - | - | - | - |
| | | | Annual | - | - | - | - | - | - | - | - |
| Collision | All developments | Guidance | Breeding | 0.998 ±<0.001 | 0.952 ±0.005 | 0.19 | 4.81 | 0.998 ±<0.001 | 0.908 ±0.006 | 0.19 | 9.21 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.937 ±0.004 | 0.25 | 6.34 | 0.998 ±<0.001 | 0.880 | 0.25 | 12.05 |
| | | | Annual | 0.996 ±<0.001 | 0.909 ±0.004 | 0.36 | 9.07 | 0.998 ±<0.001 | 0.830 ±0.004 | 0.36 | 17.01 |

| Impact type | Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | All developments excluding Berwick Bank | Guidance | Breeding | 0.999 ±<0.001 | 0.976 ±0.005 | 0.09 | 2.44 | 0.999 ±<0.001 | 0.953 ±0.006 | 0.09 | 4.69 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.945 ±0.004 | 0.22 | 5.51 | 0.998 ±<0.001 | 0.895 ±0.006 | 0.22 | 10.51 |
| | | | Annual | 0.997 ±<0.001 | 0.931 ±0.004 | 0.27 | 6.89 | 0.998 ±<0.001 | 0.870 ±0.004 | 0.27 | 13.06 |
| | All Consented developments plus Proposed Development (OWF) | Guidance | Breeding | 0.999 ±<0.001 | 0.982 ±0.005 | 0.07 | 1.84 | 0.999 ±<0.001 | 0.964 ±0.006 | 0.07 | 3.55 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.958 ±0.004 | 0.16 | 4.17 | 0.998 ±<0.001 | 0.920 ±0.004 | 0.16 | 8.01 |
| | | | Annual | 0.998 ±<0.001 | 0.948 ±0.004 | 0.21 | 5.22 | 0.998 ±<0.001 | 0.900 ±0.004 | 0.21 | 9.97 |
| Combined | All developments | Applicant (30%,1%) | Breeding | 0.998 ±<0.001 | 0.942 ±0.005 | 0.227 | 5.760 | 0.997 ±<0.001 | 0.890 ±0.006 | 0.227 | 10.958 |
| | | | Non-breeding | 0.997 ±<0.001 | 0.932 ±0.004 | 0.27 | 6.76 | 0.997 ±<0.001 | 0.872 ±0.004 | 0.27 | 12.82 |
| | | | Annual | 0.998 ±<0.001 | 0.900 ±0.004 | 0.405 | 10.005 | 0.996 ±<0.001 | 0.813 ±0.004 | 0.404 | 18.675 |
| | | | Breeding | 0.997 ±<0.001 | 0.924 ±0.005 | 0.302 | 7.565 | 0.997 ±<0.001 | 0.857 ±0.006 | 0.301 | 14.279 |

| Impact type | Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | | Guidance (30%,3%, 30%,1%) | Non-breeding | 0.998 ±<0.001 | 0.924 ±0.004 | 0.30 | 7.62 | 0.997 ±<0.001 | 0.856 ±0.004 | 0.30 | 14.38 |
| | | | Annual | 0.998 ±<0.001 | 0.988 ±0.004 | 0.485 | 11.875 | 0.995 ±<0.001 | 0.780 ±0.004 | 0.485 | 21.952 |
| | All developments excluding Berwick Bank | Applicant (30%,1%) | Breeding | 0.998 ±<0.001 | 0.970 ±0.005 | 0.117 | 3.012 | 0.998 ±<0.001 | 0.942 ±0.006 | 0.117 | 5.815 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.924 ±0.004 | 0.22 | 5.68 | 0.997 ±<0.001 | 0.892 ±0.004 | 0.22 | 10.85 |
| | | | Annual | 0.998 ±<0.001 | 0.926 ±0.004 | 0.295 | 7.390 | 0.997 ±<0.001 | 0.860 ±0.004 | 0.294 | 13.965 |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.998 ±<0.001 | 0.959 ±0.005 | 0.162 | 4.118 | 0.998 ±<0.001 | 0.920 ±0.006 | 0.162 | 7.923 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.939 ±0.004 | 0.24 | 6.00 | 0.998 ±<0.001 | 0.885 ±0.005 | 0.24 | 11.43 |
| | | | Annual | 0.998 ±<0.001 | 0.917 ±0.004 | 0.335 | 8.352 | 0.997 ±<0.001 | 0.843 ±0.004 | 0.335 | 15.719 |
| | All Consented developments plus Proposed Development (OWF) | Applicant (30%,1%) | Breeding | 0.998 ±<0.001 | 0.977 ±0.005 | 0.088 | 2.268 | 0.999 ±<0.001 | 0.956 ±0.006 | 0.088 | 4.381 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.957 ±0.004 | 0.17 | 4.31 | 0.998 ±<0.001 | 0.917 ±0.005 | 0.17 | 8.27 |

| Impact type | Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | | | Annual | 0.998 ±<0.001 | 0.944 ±0.004 | 0.221 | 5.604 | 0.998 ±<0.001 | 0.893 ±0.004 | 0.221 | 10.694 |
| | | Guidance (30%,3%, 30%,1%) | Breeding | 0.998 ±<0.001 | 0.969 ±0.005 | 0.121 | 3.104 | 0.998 ±<0.001 | 0.940 ±0.006 | 0.121 | 5.995 |
| | | | Non-breeding | 0.998 ±<0.001 | 0.954 ±0.004 | 0.18 | 4.60 | 0.998 ±<0.001 | 0.912 ±0.005 | 0.18 | 8.82 |
| | | | Annual | 0.998 ±<0.001 | 0.936 ±0.004 | 0.253 | 6.381 | 0.997 ±<0.001 | 0.879 ±0.004 | 0.253 | 12.116 |
| Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold | | | | | | | | | | | |

Table 5-7: Cumulative PVA results for northern gannet when considering the relevant regional population estimates derived from the SMP for the 25 year and 50 year outputs.

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| **Applicant** | | | | | | | | | | |
| All developments | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.972 (±<0.003) | 0.108 | 2.767 | 0.999 (±<0.001) | 0.946 (±<0.004) | 0.108 | 5.357 |
| | | Non-breeding | 0.998 (±<0.001) | 0.945 (±<0.003) | 0.217 | 5.499 | 0.998 (±<0.001) | 0.895 (±<0.004) | 0.217 | 10.495 |
| | | Annual | 0.998 (±<0.001) | 0.998 (±<0.001) | 0.215 | 5.454 | 0.998 (±<0.004) | 0.894 (±<0.004) | 0.215 | 10.422 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.998 (±<0.001) | 0.960 (±<0.003) | 0.155 | 3.965 | 0.997 (±<0.001) | 0.924 (±<0.004) | 0.155 | 7.625 |
| | | Non-breeding | 0.997 (±<0.001) | 0.913 (±<0.003) | 0.349 | 8.689 | 0.997 (±<0.001) | 0.837 (±<0.004) | 0.349 | 16.314 |
| | | Annual | 0.997 (±<0.001) | 0.997 (±<0.001) | 0.328 | 8.197 | 0.997 (±<0.004) | 0.846 (±<0.004) | 0.328 | 15.430 |
| All developments excluding Berwick Bank | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.973 (±<0.003) | 0.103 | 2.657 | 0.999 (±<0.001) | 0.948 (±<0.004) | 0.104 | 5.154 |
| | | Non-breeding | 0.998 (±<0.001) | 0.946 (±<0.003) | 0.212 | 5.382 | 0.998 (±<0.001) | 0.897 (±<0.004) | 0.212 | 10.271 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | | Annual | 0.998 (±<0.001) | 0.998 (±<0.001) | 0.209 | 5.293 | 0.998 (±<0.004) | 0.899 (±<0.004) | 0.209 | 10.112 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.964 (±<0.003) | 0.143 | 3.647 | 0.999 (±<0.001) | 0.930 (±<0.004) | 0.142 | 7.017 |
| | | Non-breeding | 0.997 (±<0.001) | 0.917 (±<0.003) | 0.334 | 8.332 | 0.997 (±<0.001) | 0.843 (±<0.004) | 0.334 | 15.683 |
| | | Annual | 0.997 (±<0.001) | 0.997 (±<0.001) | 0.308 | 7.707 | 0.997 (±<0.004) | 0.854 (±<0.004) | 0.308 | 14.564 |
| All Consented developments plus Proposed Development (OWF) | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.977 (±<0.003) | 0.091 | 2.334 | 0.999 (±<0.001) | 0.955 (±<0.004) | 0.091 | 4.519 |
| | | Non-breeding | 0.998 (±<0.001) | 0.954 (±<0.003) | 0.179 | 4.565 | 0.998 (±<0.001) | 0.913 (±<0.004) | 0.179 | 8.748 |
| | | Annual | 0.998 (±<0.001) | 0.998 (±<0.001) | 0.179 | 4.558 | 0.998 (±<0.004) | 0.912 (±<0.004) | 0.179 | 8.752 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.969 (±<0.003) | 0.121 | 3.112 | 0.999 (±<0.001) | 0.940 (±<0.004) | 0.122 | 6.009 |
| | | Non-breeding | 0.997 (±<0.001) | 0.930 (±<0.003) | 0.280 | 7.019 | 0.997 (±<0.001) | 0.867 (±<0.004) | 0.279 | 13.303 |
| | | Annual | 0.997 (±<0.001) | 0.997 (±<0.001) | 0.260 | 6.552 | 0.997 (±<0.004) | 0.876 (±<0.004) | 0.260 | 12.446 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| **Guidance** | | | | | | | | | | |
| All developments | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.972 (±<0.003) | 0.109 | 2.798 | 0.999 (±<0.001) | 0.895 (±<0.006) | 0.109 | 5.408 |
| | | Non-breeding | 0.998 (±<0.001) | 0.925 (±<0.005) | 0.217 | 7.535 | 0.998 (±<0.001) | 0.895 (±<0.005) | 0.217 | 10.497 |
| | | Annual | 0.998 (±<0.001) | 0.945 (±<0.003) | 0.217 | 5.491 | 0.998 (±<0.001) | 0.895 (±<0.004) | 0.217 | 10.476 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.998 (±<0.001) | 0.960 (±<0.003) | 0.157 | 3.996 | 0.998 (±<0.001) | 0.923 (±<0.004) | 0.156 | 7.677 |
| | | Non-breeding | 0.997 (±<0.001) | 0.882 (±<0.005) | 0.348 | 11.823 | 0.997 (±<0.001) | 0.837 (±<0.005) | 0.349 | 16.327 |
| | | Annual | 0.997 (±<0.001) | 0.918 (±<0.003) | 0.329 | 8.224 | 0.997 (±<0.001) | 0.845 (±<0.004) | 0.329 | 15.486 |
| All developments excluding Berwick Bank | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.973 (±<0.003) | 0.105 | 2.685 | 0.999 (±<0.001) | 0.948 (±<0.004) | 0.105 | 5.200 |
| | | Non-breeding | 0.998 (±<0.001) | 0.926 (±<0.005) | 0.212 | 7.362 | 0.998 (±<0.001) | 0.897 (±<0.006) | 0.213 | 10.279 |
| | | Annual | 0.998 (±<0.001) | 0.947 (±<0.003) | 0.210 | 5.320 | 0.998 (±<0.001) | 0.898 (±<0.004) | 0.210 | 10.161 |

| Cumulative scenario | Scenario | Season | 25 Year | | | | 50 Year | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) | Median CGR (SD) | Median CPS (SD) | Decrease in CGR (%) | Decrease in CPS (%) |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.963 (±<0.003) | 0.144 | 3.669 | 0.999 (±<0.001) | 0.929 (±<0.004) | 0.144 | 7.075 |
| | | Non-breeding | 0.997 (±<0.001) | 0.886 (±<0.005) | 0.334 | 11.355 | 0.997 (±<0.001) | 0.843 (±<0.005) | 0.334 | 15.702 |
| | | Annual | 0.997 (±<0.001) | 0.923 (±<0.003) | 0.309 | 7.742 | 0.997 (±<0.001) | 0.854 (±<0.004) | 0.309 | 14.617 |
| All Consented developments plus Proposed Development (OWF) | Applicant (70%,1%) | Breeding | 0.999 (±<0.001) | 0.976 (±<0.003) | 0.091 | 2.355 | 0.999 (±<0.001) | 0.954 (±<0.004) | 0.092 | 4.573 |
| | | Non-breeding | 0.998 (±<0.001) | 0.938 (±<0.005) | 0.179 | 6.246 | 0.998 (±<0.001) | 0.913 (±<0.006) | 0.180 | 8.749 |
| | | Annual | 0.998 (±<0.001) | 0.954 (±<0.003) | 0.180 | 4.587 | 0.998 (±<0.001) | 0.912 (±<0.004) | 0.181 | 8.803 |
| | Guidance (70%,3%, 70%,1%) | Breeding | 0.999 (±<0.001) | 0.969 (±<0.003) | 0.123 | 3.139 | 0.999 (±<0.001) | 0.939 (±<0.004) | 0.123 | 6.073 |
| | | Non-breeding | 0.997 (±<0.001) | 0.938 (±<0.005) | 0.280 | 9.592 | 0.999 (±<0.001) | 0.867 (±<0.006) | 0.280 | 13.311 |
| | | Annual | 0.997 (±<0.001) | 0.934 (±<0.003) | 0.261 | 6.574 | 0.997 (±<0.001) | 0.875 (±<0.004) | 0.261 | 12.493 |

Cells filled with an '-' are scenarios which did not exceed the 0.02 % change in adult survival rate threshold.

# 6 References

[1] NatureScot (2023) 'Guidance Note 11: Guidance to support Offshore Wind Applications: Marine Ornithology - Recommendations for Seabird Population Viability Analysis (PVA)'. Available at: https://www.nature.scot/doc/guidance-note-11-guidance-support-offshore-wind-applications-marine-ornithology-recommendations (Accessed 01/05/2024)

[2] Searle, K., Mobbs, D., Daunt, F. and Butler, A. (2019) 'A Population Viability Analysis Modelling Tool for Seabird Species'. Centre for Ecology & Hydrology report for Natural England. Natural England Commissioned Report NECR274

[3] WWT Consulting (2012) 'SOSS-04 Gannet Population Viability Analysis: Developing guidelines on the use of Population Viability Analysis for investigating bird impacts due to offshore wind farms'. Report to The Crown Estate

[4] Begon, M., Townsend, C. R. and Harper John L. (2005) 'Ecology: From Individuals to Ecosystems'. 4th Edition. Hoboken, New Jersey, USA: Wiley-Blackwell.

[5] Ridge, K., Jones, C., Jones, G. and Kean, G. (2019) 'Norfolk Vanguard Offshore Wind Farm Examing Authority's Report of Findings and Conclusions and Recommendations to the Secretary of State for Business, Energy and Industrial Strategy'

[6] Horswill, C. and Robinson, R.A. (2015) 'Review of Seabird Demographic Rates and Density Dependence'. JNCC Report No. 552, JNCC, Peterborough, ISSN 0963-8091

[7] Cook, A.S.C.P. and Robinson, R.A. (2016) 'Testing sensitivity of metrics of seabird population response to offshore wind farm effects'. JNCC Report No. 553, JNCC, Peterborough, ISSN 0963-8091

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