MacArthur Green

West of Orkney Windfarm

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West of Orkney Windfarm

Offshore Ornithology Additional Information

Appendix 4 - EIA and HRA: Displacement Technical Report

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CONTENTS

1 INTRODUCTION ... 1
1.1 Project summary ... 1
1.2 Relationship between the original application and the OAI ... 2
1.3 Purpose of this Report ... 2
1.4 Terminology ... 3
2 METHODS ... 3
2.1 Species included in displacement assessment ... 4
2.2 Overview of Approach ... 6
2.3 Overview of Matrix Approach ... 7
2.3.1 Spatial Scales ... 7
2.3.2 Seasonal Definitions ... 8
2.3.3 Mean seasonal peak population estimates ... 10
2.3.4 Displacement and mortality rates used for the impact assessment ... 27
2.4 SeabORD modelling tool Approach ... 29
3 RESULTS ... 32
3.1 Individual species accounts using displacement matrices ... 32
3.1.1 Kittiwake ... 32
3.1.2 Arctic tern ... 36
3.1.3 Guillemot ... 40
3.1.4 Razorbill ... 42
3.1.5 Puffin ... 47
3.1.6 Fulmar ... 49
3.1.7 Gannet ... 54
3.2 Predicted guillemot and razorbill displacement mortalities generated by SeabORD ... 58
4 SUMMARY OF DISPLACEMENT MORTALITIES TAKEN INTO THE IMPACT ASSESSMENT ... 59
4.1 Comparison between matrix approach and SeabORD ... 59
4.2 Displacement mortality predicted using the matrix approach ... 59
5 REFERENCES ... 61

LIST OF TABLES

Table 2-1. Species-specific seasonal definitions for species vulnerable to displacement, taken from NatureScot (Guidance Note 9) and the BDMPS report (Furness, 2015). 9
Table 2-2. Kittiwake abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 11
Table 2-3. Kittiwake abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 13
Table 2-4. Arctic tern abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 14
Table 2-5. Arctic tern abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 15
Table 2-6. Guillemot abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 16
Table 2-7. Guillemot abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 17
Table 2-8. Razorbill abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 18
Table 2-9. Razorbill abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 19
Table 2-10. Puffin abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 20
Table 2-11. Puffin abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 21
Table 2-12. Fulmar abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 22
Table 2-13. Fulmar abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 23

Table 2-14. Gannet abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season. 24
Table 2-15. Gannet abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season..... 25
Table 2-16 Summary of Mean Seasonal Peak (MSP) abundance calculations for all birds recorded in flight and on the sea in the OAA and the OAA plus 2 km buffer. MSPs are presented for each season. 26
Table 2-17. Displacement and mortality rates used for the displacement assessment, as advised in NatureScot's Guidance Note 8 and pre-application Project specific advice..... 28
Table 3-1. Potential kittiwake mortality following displacement from the OAA in the breeding season..... 33
Table 3-2. Potential kittiwake mortality following displacement from the OAA plus 2 km buffer in the breeding season. 33
Table 3-3. Potential kittiwake mortality following displacement from the OAA in the non-breeding season..... 34
Table 3-4. Potential kittiwake mortality following displacement from the OAA plus 2 km buffer in the non-breeding season..... 34
Table 3-5. Potential kittiwake mortality following displacement from the OAA in the spring migration season..... 35
Table 3-6. Potential kittiwake mortality following displacement from OAA plus 2 km buffer in the spring migration season. 35
Table 3-7. Potential kittiwake mortality following displacement from the OAA in the autumn migration season..... 36
Table 3-8. Potential kittiwake mortality following displacement from the OAA plus 2 km buffer in the autumn migration season. 36
Table 3-9. Potential Arctic tern mortality following displacement from the OAA in the breeding season..... 37
Table 3-10. Potential Arctic tern mortality following displacement from the OAA plus 2 km buffer in the breeding season. 37
Table 3-11. Potential Arctic tern mortality following displacement from the OAA in the spring migration season..... 38
Table 3-12. Potential Arctic tern mortality following displacement from the OAA plus 2 km buffer in the spring migration season..... 38
Table 3-13. Potential Arctic tern mortality following displacement from OAA in the autumn migration season..... 39
Table 3-14. Potential Arctic tern mortality following displacement from OAA plus 2 km buffer in the autumn migration season..... 39
Table 3-15. Potential guillemot mortality following displacement from the OAA in the breeding season..... 40
Table 3-16. Potential guillemot mortality following displacement from the OAA plus 2 km buffer in the breeding season. 40
Table 3-17. Potential guillemot mortality following displacement from the OAA in the non-breeding season..... 41

Table 3-18. Potential guillemot mortality following displacement from OAA plus 2 km buffer in the non-breeding season. 41
Table 3-19. Potential razorbill mortality following displacement from the OAA in the breeding season. 42
Table 3-20. Potential razorbill mortality following displacement from the OAA plus 2 km buffer in the breeding season. 42
Table 3-21. Potential razorbill mortality following displacement from the OAA in the non-breeding season. 43
Table 3-22. Potential razorbill mortality following displacement from OAA plus 2 km buffer in the non-breeding season. 43
Table 3-23. Potential razorbill mortality following displacement from the OAA in the spring migration season. 44
Table 3-24. Potential razorbill mortality following displacement from the OAA plus 2 km buffer in the spring migration season. 44
Table 3-25. Potential razorbill mortality following displacement from the OAA in the autumn migration season. 45
Table 3-26. Potential razorbill mortality following displacement from the OAA plus 2 km buffer in the autumn migration season. 45
Table 3-27. Potential razorbill mortality following displacement from OAA in the winter period. 46
Table 3-28. Potential razorbill mortality following displacement from OAA plus 2 km buffer in the winter period. 46
Table 3-29. Potential puffin mortality following displacement from the OAA in the breeding season. 47
Table 3-30. Potential puffin mortality following displacement from the OAA plus 2 km buffer in the breeding season. 47
Table 3-31. Potential puffin mortality following displacement from the OAA in the non-breeding season. 48
Table 3-32. Potential puffin mortality following displacement from the OAA plus 2 km buffer in the non-breeding season. 48
Table 3-33. Potential fulmar mortality following displacement from the OAA in the breeding season. 49
Table 3-34. Potential fulmar mortality following displacement from OAA plus 2 km buffer in the breeding season. 49
Table 3-35. Potential fulmar mortality following displacement from OAA in the non-breeding season. 50
Table 3-36. Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the non-breeding season. 50
Table 3-37. Potential fulmar mortality following displacement from the OAA in the spring migration season. 51
Table 3-38. Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the spring migration season. 51
Table 3-39. Potential fulmar mortality following displacement from the OAA in the autumn migration season. 52
Table 3-40. Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the autumn migration season. 52

Table 3-41. Potential fulmar mortality following displacement from the OAA in the winter period. 53
Table 3-42 Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the winter period. 53
Table 3-43. Potential gannet mortality following displacement from the OAA in the breeding season. 54
Table 3-44. Potential gannet mortality following displacement from the OAA plus 2 km buffer in the breeding season. 54
Table 3-45. Potential gannet mortality following displacement from the OAA in the non-breeding season. 55
Table 3-46. Potential gannet mortality following displacement from OAA plus 2 km buffer in the non-breeding season. 55
Table 3-47. Potential gannet mortality following displacement from the OAA in the spring migration season. 56
Table 3-48. Potential gannet mortality following displacement from OAA plus 2 km buffer in the spring migration season. 56
Table 3-49. Potential gannet mortality following displacement from the OAA in the autumn migration season. 57
Table 3-50. Potential gannet mortality following displacement from the OAA plus 2 km buffer in the autumn migration season. 57
Table 3-51. Mean percentage point reduction in adult and chick survival rate for guillemot and puffin, by SPA, caused by displacement from the OAA plus a 2 km buffer, as predicted by SeabORD, assuming a moderate prey year. See Table 3.1 to Table 3.4 in Annex 4A: SeabORD Analysis Final Report for more details. 58
Table 4-1. Summary of predicted seasonal displacement impacts (number of mortalities per annum) from displacement within the OAA and the OAA plus 2 km buffer for LOW and HIGH displacement/mortality values for each species. Annual total is the sum of the breeding and non-breeding season estimates. 59

LIST OF FIGURES

Figure 1-1. Map showing location of the West of Orkney Windfarm Option Agreement Area (OAA) and Export Cable Corridor (ECC) which together, comprise the Offshore Project Area. 1

1 INTRODUCTION

1.1 Project summary

1. Offshore Wind Power Limited (OWPL) ('the Applicant') is proposing the development of the West of Orkney Windfarm ('the Project'), an Offshore Wind Farm (OWF), located at least 23 kilometres (km) from the north coast of Scotland and 28 km from the west coast of Hoy, Orkney (**Figure 1-1**).

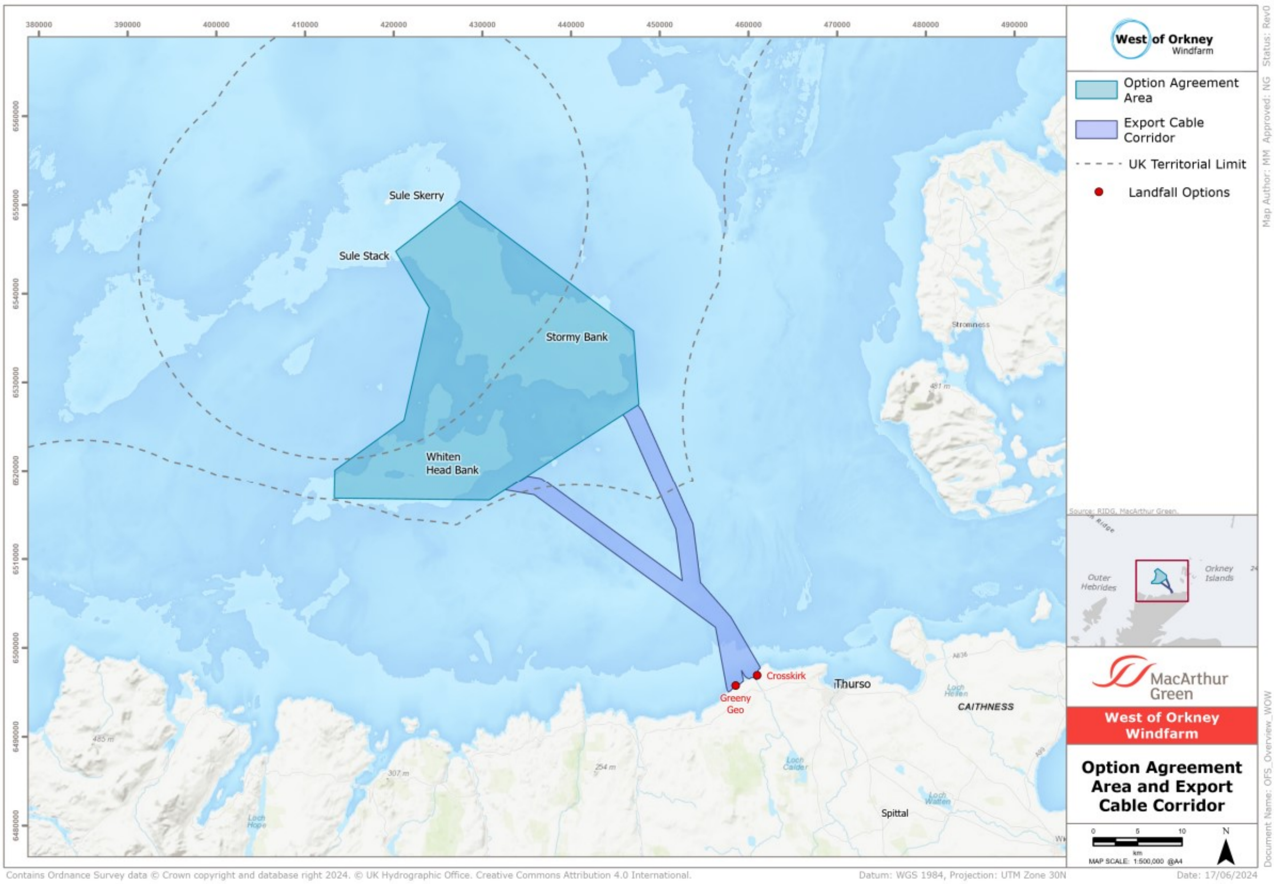

Figure 1-1. Map showing location of the West of Orkney Windfarm Option Agreement Area (OAA) and Export Cable Corridor (ECC) which together, comprise the Offshore Project Area.

2. The Offshore Project will comprise up to 125 wind turbine generators (WTGs) with fixed-bottom foundations and up to five Offshore Substation Platforms (OSPs). The area within which the WTGs, OSPs and associated infrastructure will be located is the Option Agreement Area (OAA). The OAA covers an area of 657 km^2. The export cables will be located within the Export Cable Corridor (ECC), with landfall options at Greeny Geo and/or Crosskirk in Caithness (**Figure 1-1**). The OAA and ECC together comprise the offshore Project area.

3. The Applicant submitted an application for consent under Section 36 of the Electricity Act 1989 and Marine Licences under Part 4 of the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 to Scottish Ministers in September 2023 for the offshore components of the Project seaward of Mean High Water Springs (MHWS).

4. In accordance with relevant EIA Regulations[1], an Offshore Environmental Impact Assessment (EIA) Report was submitted to Marine Directorate – Licensing Operations Team (MD-LOT) as part of the Applicant's consent application (the 'Offshore EIA Report'). A Report to Information Appropriate Assessment (RIAA) was also submitted as part of the Offshore Application to provide the Competent Authority (MD-LOT) with the information required to assist them in undertaking an Appropriate Assessment (AA) for the offshore Project as required under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended), the Conservation of Marine Habitats and Species Regulations 2017 and The Conservation of Habitats and Species Regulations 2017 (as amended) (hereafter referred to as the 'Habitats Regulations').

5. Following the review of the Applicant's application, and upon receipt of representations from consultees, MD-LOT issued a request for Additional Information on offshore ornithology. This report is part of the Ornithology Additional Information (OAI).

1.2 Relationship between the original application and the OAI

6. The Ornithology Additional Information (OAI) (see **Introduction to the Additional Ornithology Information** for structure of OAI and list of all reports) includes:

- an **Addendum to the Offshore EIA Report** in the form of a revised EIA chapter for Offshore and Intertidal Ornithology. All ornithology information in this report should be read in place of information in the original EIA chapter;
- an **Addendum to the RIAA**. All ornithology information in this report should be read in place of information in the original RIAA (with the exception of information on pre-application consultation);
- a set of nine technical appendices. This **Appendix 4 - EIA and HRA: Displacement Technical Report** is one of the nine technical appendices. These reports entirely replace the original Supporting Study 12: Offshore Ornithology Technical Supporting Study.

7. NatureScot's pre- and post-application Project-specific advice and online guidance notes[2] were followed throughout the OAI. To demonstrate this, reference to NatureScot's guidance and advice is made throughout the OAI, either in the text or in separate text boxes.

1.3 Purpose of this Report

8. Disturbance and displacement impact pathways, arising during construction and operation, from both the offshore Project itself and vessels associated with construction and operation of the Project, were identified during HRA screening (**Appendix 2 - HRA: HRA Screening Technical Report**). Disturbance and displacement associated with vessels is assessed

[1] *The relevant EIA Regulations include the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and the Marine Works (Environmental Impact Assessment) Regulations 2007.*

[2] Guidance Note 1: Guidance to support Offshore Wind Applications: Marine Ornithology - Overview | NatureScot

qualitatively, in the **Addendum to the RIAA**, in **Section 6.1.1** and **Section 6.2.2.** A quantitative assessment was undertaken for assessing disturbance and displacement occurring during Project operation, due to the presence of WTGs and other offshore infrastructure in the OAA.

9. This **Appendix 4 - EIA and HRA: Displacement Technical Report** provides information on the quantitative approach used for predicting displacement mortality that could occur in the OAA during Project operation. This information is used in the impact assessments presented in the **Addendum to the Offshore EIA Report** and the **Addendum to the RIAA**.

10. This report includes the following annex:

- Annex 4A: SeabORD Analysis Final Report.

1.4 Terminology

11. The following terminology is used in this report:

- Option Agreement Area (OAA): this is the area within which WTGs and other offshore Project infrastructure will be installed;
- Export Cable Corridor (ECC) is the area from the OAA to the landfall site in which the export cable will be placed;
- Offshore Project area comprises the OAA and ECC;
- OAA plus 2 km buffer: This includes a 2 km wide 'zone of influence' around the OAA, allowing for changes in bird behaviour (e.g. disturbance/displacement) in the vicinity of the OAA;
- OAA plus 4 km buffer: the OAA plus 4 km buffer was the area used for characterising baseline seabird numbers and distribution for the Project (see **Appendix 1 - EIA and HRA: Baseline Site Characterisation Technical Report**);
- WTG: Wind Turbine Generator.

2 METHODS

12. Furness *et al*. (2013) defines displacement as 'a reduced number of birds occurring within or immediately adjacent to an offshore wind farm', due to the presence of wind turbine generators (WTG) and/or other offshore infrastructure. This could result in birds no longer being able to use their preferred foraging area, having to forage elsewhere which could be sub optimal and/or potentially having increased inter and intra specific competition.

13. Birds that would have previously flown through the area prior to construction of the offshore wind farm (OWF), and which either stop short or detour around a development, are subject to barrier effects (SNCB, 2022). For the purposes of assessment, it is usually not possible to distinguish between displacement and barrier effects (e.g., to determine if individual birds may have intended to travel to, or beyond an offshore wind farm, even when tracking data are available).

14. Both displacement and barrier effects result in a change in a bird's behaviour in response to the presence of an OWF. If a reduction in foraging efficiency (reduced daily energy intake) and/or increased energetic cost of foraging occurs (increased daily energy expenditure), birds will have a reduced daily energetic budget. Over a longer period of time, this could lead to demographic consequences. Body condition will decline, ultimately leading to a reduction in reproductive success (e.g. failure to provision chicks, electing to take a year off breeding) and even death.

15. Predicting the extent of displacement and barrier effects on marine birds is challenging. Two approaches are currently used to estimate potential mortality and reduction in breeding success due to displacement and barrier effects:

- A displacement matrix approach: this very simple approach assumes a proportion of birds using the OWF development area prior to construction will be displaced following construction. A proportion of displaced birds are then assumed to suffer mortality as a consequence of displacement;
- SeabORD: SeabORD (Searle *et al.,* 2018) is a spatially-explicit individual-based energetics model that relies on a large number of parameters to determine foraging decisions of breeding birds, energy intake and expenditure, and consequent demographic consequences for a population of seabirds, when displaced.

16. NatureScot provide guidance on how to assess displacement in their Guidance Note 8[3]. This guidance advises to assess displacement using both a matrix approach based on the Joint SNCB Interim Displacement Advice Note produced by the Statutory Nature Conservation Bodies (SNCB, 2022) and using the SeabORD tool (Searle *et al*. 2018). Both these approaches were used to estimate potential displacement mortality arising from operation of the Project.

2.1 Species included in displacement assessment

17. Species selected for the displacement assessment included those that met the following criteria:

- Species recorded regularly within the OAA plus a 2km buffer during Digital Aerial Surveys (DASs) undertaken between July 2020 to September 2022 (refer to **Technical Appendix 1 - EIA and HRA: Baseline Site Characterisation Technical Report**); and
- Species considered susceptible to disturbance (i.e. have medium or high 'Disturbance Sensitivity' and 'Habitat Specialisation' scores as assessed by Bradbury *et al.*, 2014 (expanded from Furness *et al*., 2013), summarised by SNCB, 2022).

18. The species that were recorded regularly in the OAA plus 4 km buffer, defined as being present in non-trivial numbers (i.e. >10 records across all 27 surveys), were:

- Black-legged kittiwake;

[3] NatureScot (2023) Guidance Note 8 is available at: https://www.nature.scot/doc/guidance-note-8-guidance-support-offshore-wind-applications-marine-ornithology-advice-assessing

- Great black-backed gull;
- Herring gull;
- Arctic tern;
- Great skua;
- Common guillemot;
- Razorbill;
- Atlantic puffin;
- European storm-petrel;
- Northern fulmar;
- Manx shearwater;
- Northern gannet.

NatureScot 5 April 2023:

"great skua scores 1 and 2 for Disturbance Susceptibility and Habitat Specialisation respectively in Bradbury et al. (2014) and European storm petrel 1 and 1, such that we would not require displacement assessment for these species"

NatureScot Consultation Meeting (11 June 2024):

Fulmar is a relatively new species to be included in displacement assessments, WOW is the first project to consider this species. Fulmar should be assessed because of barrier effects and the location of the Project. Fulmar should be assessed only for the project alone for breeding and non-breeding, there is no requirement for an in-combination assessment for this species (because other projects in the past have not been required to assess fulmar, and therefore displacement mortality values are not available for other wind farms).

19. NatureScot advised (5 April 2023) that displacement assessment for great skua and European storm petrel was not required as these species are considered to be at low risk of displacement (Bradbury *et al.*, 2014). Additionally, Manx shearwater, great black-backed gull and herring gull have been shown to not be displaced or to experience barrier effects (Furness *et al.*, 2013).

20. Pre-application consultation with NatureScot (8 February 2023), led to agreement that displacement assessment was required for seven species, listed below. NatureScot advised that fulmar should be assessed for displacement. This was reiterated during a consultation meeting (on 11 June 2024).

    - Kittiwake (Rissa tridactyla);
    - Arctic tern (Sterna paradisaea);
    - Guillemot (*Uria aalge*);

- Razorbill (*Alca torda*);
- Puffin (Fratercula arctica);
- Fulmar (Fulmarus glacialis); and
- Gannet (Morus bassanus).

2.2 Overview of Approach

NatureScot Guidance Note 8 (2023):

Displacement and barrier effects should be assessed using the Joint SNCB Interim Displacement Advice Note (2022) matrix methods and the SeabORD tool (Searle et al. 2018) as appropriate to species and season.

21. Following NatureScot 2023 Guidance Note 8, two methods were used to estimate displacement mortality: the matrix approach (SNCB, 2022) and SeabORD (Searle *et al.* 2018).

22. For all seven species considered to be at risk of displacement as advised by NatureScot (consultation meeting, 8 February 2023), the matrix approach was used to predict the number of birds that would be killed as a result of being displaced from the OAA as well as the OAA plus a 2 km buffer. NatureScot requested that displacement mortality for the OAA alone as well as the OAA plus 2 km buffer was provided (consultation meeting, 26 February 2024).

23. On 31 May 2023 (by email) NatureScot advised that SeabORD should also be used to assess displacement mortality for guillemot and puffin. NatureScot advised that, "*SeabORD considers consequences to both adult mortality and productivity and allows for some quantification of uncertainty. The number of colonies which SeabORD can run simultaneously will depend on the version used. Updates to SeabORD through the Cumulative Effects Framework will address this constraint. As advised during pre-application, we understand that Vallejo et al. 2022 is being peer reviewed – until this is complete we reserve comment on the issues raised in this paper*." The Cumulative Effects Framework, and the updated version of SeabORD therein, currently remains unavailable. Consequently, the assessment of Project displacement and barrier effects undertaken using SeabORD, which was included in the original Supporting Study 12: Offshore Ornithology Technical Supporting Study is provided here (see **Annex 4A: SeabORD Analysis Final Report).**

24. For guillemot and puffin only, SeabORD was used to model the effects on individual colonies of these species for colonies within foraging range of the OAA plus 2 km buffer where significant displacement effects could occur (for details refer to **Annex 4A: SeabORD Analysis Final Report**). SeabORD was used to predict reductions in guillemot and puffin survival and productivity as a result of being displaced from the OAA plus a 2 km buffer, as advised by NatureScot (email dated 31 May 2023).

2.3 Overview of Matrix Approach

NatureScot Guidance Note 8 (2023):

The Joint SNCB Interim Displacement Advice Note (2022) details how this approach should be undertaken. We advise this should be followed to complete the displacement assessment.

25. Following NatureScot 2023 Guidance Note 8 and the matrix approach set out in the Joint SNCB Interim Displacement Advice Note (2022), displacement matrices were produced for each of the seven species, using a number of species-specific parameters:

i. spatial extent – the distance from the edge of OAA that displacement impacts are considered likely to affect the species, i.e. zone of influence (refer to **section 2.3.1**);

ii. seasons – breeding and non-breeding seasons assessment of displacement mortality (refer to **section 2.3.2**);

iii. Mean Seasonal Peak abundance –mean of the peak abundance in a season across two years of survey is the estimate of birds using the area prior to constructing an OWF. Mean Seasonal Peak (MSP) abundance was calculated following advice in NatureScot Guidance Note 8 (refer to **section 2.3.3**);

iv. displacement rate - the percentage of the MSP population assumed to be displaced from the impacted area (refer to **section 2.3.4**); and

v. displacement mortality rate – the percentage of displaced birds suffering mortality (refer to **section 2.3.4**).

2.3.1 Spatial Scales

NatureScot Guidance Note 8 (2023):

For most species the zone of influence will extend to 2 km beyond the development footprint, however, there are some exceptions to this for more sensitive species (red-throated divers being 10 km, and for other divers and seaducks 4 km).

NatureScot Consultation Meeting (26 February 2024):

Please include a displacement matrix table with no buffer, as well as matrix tables with a buffer.

26. Following NatureScot 2023 Guidance Note 8 and the Joint SNCB Interim Displacement Advice Note (2022), displacement matrices for the seven species listed above were produced for the OAA alone and the OAA plus 2 km buffer (as requested by NatureScot, consultation meeting 26 February 2024). As the species included in the displacement assessment did not include

either divers or seaducks (refer to **section 2.1**), in-keeping with the SNCB guidance (SNCB, 2022), a 2 km buffer was applied to the displacement mortality assessment.

2.3.2 Seasonal Definitions

NatureScot Guidance Note 8 (2023):

Our seasonal definitions guidance note [NatureScot 2023 Guidance Note 9] *should be used for determining which months to include for each species' breeding season.*

The matrices should be presented for the non-breeding season for all species vulnerable to displacement and/or barrier impacts. The non-breeding season should be defined using our seasonal definitions guidance note [NatureScot 2023 Guidance Note 9].

The non-breeding season assessment should be presented, as per the breeding season guidance (above) – however, as described in our apportioning guidance note the predicted mortality impacts should be considered in the context of the regional populations as defined by the Biologically Defined Minimum Population Scale (BDMPS) (Furness, 2015).

NatureScot Consultation Meeting (21 May 2024):

NatureScot confirmed that breeding and non-breeding seasons are identified as follows:

- *Breeding season: birds are strongly associated with nest site – nesting, egg laying, provisioning young*
- *Non-breeding season: birds are more widely dispersed and not strongly associated with nest site. This period subsumes the 'breeding site attendance' periods defined in NatureScot's seasonal definitions guidance.*

Non-breeding season apportioning is dependent on information within BDMPS (Furness 2015). Where Furness seasons overlap with NS breeding seasons Furness seasons should be foreshortened. For some species Furness identifies a single non-breeding (winter) period, for others there are also autumn and spring migration BDMPS which should be used.

27. Following NatureScot Guidance Note 8, the matrix approach requires potential displacement to be assessed separately for species in two seasons (breeding season and non-breeding season).

28. The seasons are defined as:

- Breeding season: birds are strongly associated with a nest site, including nesting, egg-laying and provisioning young.
- Non-breeding season: period of time where no breeding takes place, which may encompass birds over-wintering in an area and migration periods between breeding and wintering sites, dependent on the species.

29. NatureScot 2023 Guidance Note 9[4] was used to define the seasons for each species. NatureScot Guidance Note 8 recommends presenting seasonal displacement mortality estimates using both the NatureScot-defined seasons and BDMPS-defined seasons. The BDMPS (Biologically Defined Minimum Population Scales) report defines different non-breeding seasons for each species, e.g. autumn migration, winter, spring migration (Furness, 2015). The seasons to use for each species were agreed during formal scoping consultation (26 May 2022) and are summarised in **Table 2-1**.

30. Although the seasons recommended in the NatureScot Guidance Note 9 show that Arctic terns do not occur outside the breeding season, the spring and autumn migration seasons for Arctic tern, provided in Furness (2015), are included to capture any displacement mortality for birds in those seasons.

Table 2-1. Species-specific seasonal definitions for species vulnerable to displacement, taken from NatureScot (Guidance Note 9) and the BDMPS report (Furness, 2015).

Species	NatureScot seasons (2023, Guidance Note 9)		BDMPS seasons (Furness, 2015)		
	Breeding season	Non-breeding season	Spring migration	Autumn migration	Winter
Kittiwake	mid-April to August	September to mid-April	January to April	August to December	-
Arctic tern	May to August	N/A	Late April to May	July to early September	-
Guillemot	April to mid-August	mid-August to March	single non-breeding season August to February		
Razorbill	April to mid-August	mid-August to March	January to March	August to October	November to December
Puffin	April to mid-August	mid-August to March	single non-breeding season mid-August to March		
Fulmar	April to mid-September	mid-September to March	December to March	September to October	November
Gannet	mid-March to September	October to mid-March	December to March	September to November	-

[4] NatureScot (2023) Guidance Note 9 is available at: https://www.nature.scot/sites/default/files/2020-10/Guidance%20note%20-%20Seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment.pdf

2.3.3 Mean seasonal peak population estimates

NatureScot Guidance Note 8 (2023):

Data should be provided in a format that allows the calculation of mean seasonal peak population estimates based on the minimum two years of baseline data. For example, for a species with a breeding season from April to July, this requires the average of the peak population estimates between April and July in year one and two. This may require the counts to originate from different months in the two years (e.g. May in the first year and June in the second year).

NatureScot Consultation Letter (03 June 2024):

The DAS campaign for West of Orkney Windfarm started in July 2020, part way through the breeding season and was completed in September 2022, covering a period of 27 months. In line with guidance note 8, we advise complete (in-year) seasons are used to calculate the mean seasonal peak to ensure the peak is fully representative [i.e. complete seasons should be selected from across the 27 months of the digital aerial survey campaign]. We acknowledge, due to the start date of the DAS campaign, that this may require exclusion of slightly different months, depending on the species to account for species-specific breeding seasons e.g. guillemot will differ from gannet.

NatureScot consultation meeting (25 June 2024):

MacArthur Green confirmed that mean seasonal peak estimates to inform displacement mortality estimation were derived from 27 months of survey data, mean densities to inform collision risk modelling used 24 months, HRA screening and the baseline site characterisation used 27 months of survey data. NatureScot agreed with this approach.

31. As advised in NatureScot Guidance Note 8, Mean Seasonal Peak (MSP) abundance estimates were used in the displacement matrices. MSPs were calculated as the peak abundance for each season, with seasonal peaks from each of the two years of survey then averaged. Abundance estimates used to calculate MSPs for each species are presented in **Table 2-2** to **Table 2-15** and are summarised in **Table 2-16**.

32. NatureScot advised (letter dated 3 June 2024, consultation meetings of 4 June 2024 and 25 June 2024) that the full 27 months of digital aerial survey should be used to ensure complete seasons from which to select a peak abundance. Using only 24 months of surveys, as was done for collision risk modelling, results in some seasons not having complete survey in all months. The use of the full 27 months of survey means all seasons had a survey in all months, ensuring the peak abundance was captured for all seasons.

33. For guillemot, razorbill and puffin, unidentified birds recorded in non-species-specific categories during digital aerial surveys (e.g. ‘auk species’ or ‘large auk’) have been apportioned to a species based on the relative abundance ratios of identified species within the category (i.e. guillemot, razorbill or puffin). Therefore, abundance estimates for these auk species used to calculate MSP, included guillemots, razorbills and puffins recorded in

non-species-specific categories. Guillemot, razorbill and puffin abundance estimates were also adjusted for availability bias to account for birds likely to be diving under the surface of the sea at the time of each aerial survey. A full description of how guillemot, razorbill and puffin estimates were apportioned for unidentified species groups and adjusted for availability bias is presented in **Appendix 1 - EIA and HRA: Baseline Site Characterisation Technical Report**.

34. For all other bird species recorded during DAS, apportioning of unidentified birds and accounting for availability bias was not required (refer to **Appendix 1 - EIA and HRA: Baseline Site Characterisation Technical Report**). This was because there were very few records of birds not identified to species, with the exception of auks.

35. For each species assessed for displacement impacts (**Section 2.1**) the peak abundance recorded within each defined season in each year was identified. When a month was split between breeding and non-breeding seasons, as defined in the NatureScot 2023 Guidance Note 9, it was assumed that the abundance in that month was appropriate for consideration for both the breeding and non-breeding season when identifying the seasonal peak.

2.3.3.1 *Kittiwake*

Table 2-2. Kittiwake abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Kittiwake Abundance Estimate in the OAA			
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)
Jul-2020	184.5	184.5	184.5	184.5
Aug-2020	183.1	183.1	183.1	183.1
Sep-2020	7.7	7.7	7.7	7.7
Oct-2020	666.8	666.8	666.8	**666.8**
Nov-2020	193.9	193.9	193.9	193.9
Dec-2020	69.7	69.7	69.7	69.7
Jan-2021	46.5	46.5	46.5	46.5
Feb-2021	216.9	216.9	216.9	216.9
Mar-2021	844.2	**844.2**	**844.2**	844.2
Apr-2021*	**302.5**	302.5	302.5	302.5
May-2021	38.8	38.8	38.8	38.8
Jun-2021	131.8	131.8	131.8	131.8
Jul-2021	77.5	77.5	77.5	77.5
Aug-2021	0.0	0.0	0.0	0.0
Sep-2021	155.0	155.0	155.0	155.0
Oct-2021	504.0	504.0	504.0	**504.0**
Nov-2021	85.1	85.1	85.1	85.1
Dec-2021	31.0	31.0	31.0	31.0
Feb (18^{th})-2022	54.2	54.2	54.2	54.2

	Kittiwake Abundance Estimate in the OAA			
Feb (26th)-2022	309.8	309.8	309.8	309.8
Mar-2022	1000.4	**1000.4**	**1000.4**	1000.4
Apr-2022*	92.8	92.8	92.8	92.8
May-2022	62.1	62.1	62.1	62.1
Jun-2022	77.4	77.4	77.4	77.4
Jul-2022	**1395.9**	1395.9	1395.9	1395.9
Aug-2022	15.6	15.6	15.6	15.6
Sep-2022	15.8	15.8	15.8	15.8
MSP	**849.2**	**922.3**	**922.3**	**585.4**

*April is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

Table 2-3. Kittiwake abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Kittiwake Abundance Estimate in the OAA plus 2 km buffer			
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)
Jul-2020	240.6	240.6	240.6	240.6
Aug-2020	230.9	230.9	230.9	230.9
Sep-2020	15.5	15.5	15.5	15.5
Oct-2020	1000.3	1000.3	1000.3	**1000.3**
Nov-2020	232.7	232.7	232.7	232.7
Dec-2020	100.7	100.7	100.7	100.7
Jan-2021	93.0	93.0	93.0	93.0
Feb-2021	232.4	232.4	232.4	232.4
Mar-2021	1185.0	**1185.0**	**1185.0**	1185.0
Apr-2021*	**496.4**	496.4	496.4	496.4
May-2021	69.8	69.8	69.8	69.8
Jun-2021	139.5	139.5	139.5	139.5
Jul-2021	100.8	100.8	100.8	100.8
Aug-2021	0.0	0.0	0.0	0.0
Sep-2021	155.0	155.0	155.0	155.0
Oct-2021	597.1	597.1	597.1	**597.1**
Nov-2021	108.4	108.4	108.4	108.4
Dec-2021	38.7	38.7	38.7	38.7
Feb (18th)-2022	85.2	85.2	85.2	85.2
Feb (26th)-2022	395.1	395.1	395.1	395.1
Mar-2022	1248.5	**1248.5**	**1248.5**	1248.5
Apr-2022*	139.3	139.3	139.3	139.3
May-2022	93.2	93.2	93.2	93.2
Jun-2022	77.4	77.4	77.4	77.4
Jul-2022	**1729.1**	1729.1	1729.1	1729.1
Aug-2022	23.4	23.4	23.4	23.4
Sep-2022	23.7	23.7	23.7	23.7
MSP	**1112.7**	**1216.8**	**1216.8**	**798.7**

*April is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

MacArthur Green

2.3.3.2 Arctic tern

Table 2-4. Arctic tern abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Arctic tern Abundance Estimate in the OAA			
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)
Jul-2020	0.0	0.0	0.0	0.0
Aug-2020	0.0	0.0	0.0	0.0
Sep-2020	0.0	0.0	0.0	0.0
Oct-2020	0.0	0.0	0.0	0.0
Nov-2020	0.0	0.0	0.0	0.0
Dec-2020	0.0	0.0	0.0	0.0
Jan-2021	0.0	0.0	0.0	0.0
Feb-2021	0.0	0.0	0.0	0.0
Mar-2021	0.0	0.0	0.0	0.0
Apr-2021	0.0	0.0	0.0	0.0
May-2021	0.0	0.0	0.0	0.0
Jun-2021	**178.3**	178.3	178.3	178.3
Jul-2021	0.0	0.0	0.0	0.0
Aug-2021	0.0	0.0	0.0	0.0
Sep-2021	0.0	0.0	0.0	0.0
Oct-2021	0.0	0.0	0.0	0.0
Nov-2021	0.0	0.0	0.0	0.0
Dec-2021	0.0	0.0	0.0	0.0
Feb (18th)-2022	0.0	0.0	0.0	0.0
Feb (26th)-2022	0.0	0.0	0.0	0.0
Mar-2022	0.0	0.0	0.0	0.0
Apr-2022	0.0	0.0	0.0	0.0
May-2022	7.8	7.8	**7.8**	7.8
Jun-2022	0.0	0.0	0.0	0.0
Jul-2022	15.9	15.9	15.9	15.9
Aug-2022	**70.2**	70.2	70.2	**70.2**
Sep-2022	0.0	0.0	0.0	0.0
MSP	**124.3**	**0.0**	**3.9**	**35.1**

Table 2-5. Arctic tern abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Arctic tern Abundance Estimate in the OAA plus 2 km buffer			
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)
Jul-2020	0.0	0.0	0.0	0.0
Aug-2020	0.0	0.0	0.0	0.0
Sep-2020	0.0	0.0	0.0	0.0
Oct-2020	0.0	0.0	0.0	0.0
Nov-2020	0.0	0.0	0.0	0.0
Dec-2020	0.0	0.0	0.0	0.0
Jan-2021	0.0	0.0	0.0	0.0
Feb-2021	0.0	0.0	0.0	0.0
Mar-2021	0.0	0.0	0.0	0.0
Apr-2021	0.0	0.0	0.0	0.0
May-2021	0.0	0.0	0.0	0.0
Jun-2021	**178.3**	178.3	178.3	178.3
Jul-2021	0.0	0.0	0.0	0.0
Aug-2021	23.2	23.2	23.2	**23.2**
Sep-2021	0.0	0.0	0.0	0.0
Oct-2021	0.0	0.0	0.0	0.0
Nov-2021	0.0	0.0	0.0	0.0
Dec-2021	0.0	0.0	0.0	0.0
Feb (18th)-2022	0.0	0.0	0.0	0.0
Feb (26th)-2022	0.0	0.0	0.0	0.0
Mar-2022	0.0	0.0	0.0	0.0
Apr-2022	0.0	0.0	0.0	0.0
May-2022	7.8	7.8	**7.8**	7.8
Jun-2022	0.0	0.0	0.0	0.0
Jul-2022	47.6	47.6	47.6	47.6
Aug-2022	**70.2**	70.2	70.2	**70.2**
Sep-2022	0.0	0.0	0.0	0.0
MSP	**124.3**	**0.0**	**3.9**	**46.7**

2.3.3.3 Guillemot

Table 2-6. Guillemot abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Guillemot Abundance Estimate in the OAA	
	Breeding season (NatureScot)	Non-breeding season (NatureScot)
Jul-2020	2919.5	2919.5
Aug-2020	828.0	828.0
Sep-2020	3106.7	**3106.7**
Oct-2020	2574.3	2574.3
Nov-2020	325.7	325.7
Dec-2020	441.7	441.7
Jan-2021	906.5	906.5
Feb-2021	2137.6	2137.6
Mar-2021	1951.8	1951.8
Apr-2021	**4762.2**	4762.2
May-2021	248.0	248.0
Jun-2021	798.4	798.4
Jul-2021	829.4	829.4
Aug-2021*	2261.1	2261.1
Sep-2021	3285.2	**3285.2**
Oct-2021	2202.1	2202.1
Nov-2021	936.6	936.6
Dec-2021	1092.7	1092.7
Feb (18th)-2022	100.7	100.7
Feb (26th)-2022	426.0	426.0
Mar-2022	217.1	217.1
Apr-2022	1276.5	1276.5
May-2022	1327.6	1327.6
Jun-2022	2113.9	2113.9
Jul-2022	**5789.9**	5789.9
Aug-2022	2598.5	2598.5
Sep-2022	2640.2	2640.2
MSP	**5276.1**	**3195.9**

*August is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

Table 2-7. Guillemot abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Guillemot Abundance Estimate in the OAA plus 2 km buffer	
	Breeding season (NatureScot)	Non-breeding season (NatureScot)
Jul-2020	4106.5	4106.5
Aug-2020	1337.6	1337.6
Sep-2020	4516.7	**4516.7**
Oct-2020	4210.4	4210.4
Nov-2020	620.4	620.4
Dec-2020	860.2	860.2
Jan-2021	1541.9	1541.9
Feb-2021	2540.4	2540.4
Mar-2021	2772.8	2772.8
Apr-2021	**6887.4**	6887.4
May-2021	395.3	395.3
Jun-2021	1000.0	1000.0
Jul-2021	1418.6	1418.6
Aug-2021*	3399.4	3399.4
Sep-2021	4269.2	**4269.2**
Oct-2021	3248.9	3248.9
Nov-2021	1192.0	1192.0
Dec-2021	1782.4	1782.4
Feb (18th)-2022	217.0	217.0
Feb (26th)-2022	650.7	650.7
Mar-2022	380.0	380.0
Apr-2022	1725.2	1725.2
May-2022	1871.1	1871.1
Jun-2022	2462.3	2462.3
Jul-2022	**9057.7**	9057.7
Aug-2022	4338.6	4338.6
Sep-2022	4039.3	4039.3
MSP	**7972.5**	**4392.9**

*August is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

2.3.3.4 *Razorbill*

Table 2-8. Razorbill abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Razorbill Abundance Estimate in the OAA				
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)	Winter (BDMPS)
Jul-2020	16.0	16.0	16.0	16.0	16.0
Aug-2020	15.9	15.9	15.9	15.9	15.9
Sep-2020	77.5	**77.5**	77.5	**77.5**	77.5
Oct-2020	0.0	0.0	0.0	0.0	0.0
Nov-2020	0.0	0.0	0.0	0.0	0.0
Dec-2020	0.0	0.0	0.0	0.0	0.0
Jan-2021	0.0	0.0	0.0	0.0	0.0
Feb-2021	62.0	62.0	**62.0**	62.0	62.0
Mar-2021	7.7	7.7	7.7	7.7	7.7
Apr-2021	62.0	62.0	62.0	62.0	62.0
May-2021	0.0	0.0	0.0	0.0	0.0
Jun-2021	46.5	46.5	46.5	46.5	46.5
Jul-2021	0.0	0.0	0.0	0.0	0.0
Aug-2021*	**123.9**	**123.9**	123.9	**123.9**	123.9
Sep-2021	62.0	62.0	62.0	62.0	62.0
Oct-2021	15.5	15.5	15.5	15.5	15.5
Nov-2021	7.7	7.7	7.7	7.7	7.7
Dec-2021	15.5	15.5	15.5	15.5	**15.5**
Feb (18th)-2022	0.0	0.0	0.0	0.0	0.0
Feb (26th)-2022	54.2	54.2	54.2	54.2	54.2
Mar-2022	100.8	100.8	**100.8**	100.8	100.8
Apr-2022	0.0	0.0	0.0	0.0	0.0
May-2022	7.8	7.8	7.8	7.8	7.8
Jun-2022	0.0	0.0	0.0	0.0	0.0
Jul-2022	**95.2**	95.2	95.2	95.2	95.2
Aug-2022	7.8	7.8	7.8	7.8	7.8
Sep-2022	94.9	94.9	94.9	94.9	94.9
MSP	**109.5**	**100.7**	**81.4**	**100.7**	**7.7**

*August is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

Table 2-9. Razorbill abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Razorbill Abundance Estimate in the OAA plus 2km					
Season	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)	Winter (BDMPS)
Jul-2020	16.0	16.0	16.0	16.0	16.0
Aug-2020	15.9	15.9	15.9	15.9	15.9
Sep-2020	93.0	**93.0**	93.0	**93.0**	93.0
Oct-2020	0.0	0.0	0.0	0.0	0.0
Nov-2020	7.8	7.8	7.8	7.8	**7.8**
Dec-2020	0.0	0.0	0.0	0.0	0.0
Jan-2021	0.0	0.0	0.0	0.0	0.0
Feb-2021	92.9	92.9	**92.9**	92.9	92.9
Mar-2021	23.2	23.2	23.2	23.2	23.2
Apr-2021	**139.6**	139.6	139.6	139.6	139.6
May-2021	0.0	0.0	0.0	0.0	0.0
Jun-2021	46.5	46.5	46.5	46.5	46.5
Jul-2021	0.0	0.0	0.0	0.0	0.0
Aug-2021*	131.6	131.6	131.6	**131.6**	131.6
Sep-2021	62.0	62.0	62.0	62.0	62.0
Oct-2021	23.3	23.3	23.3	23.3	23.3
Nov-2021	7.7	7.7	7.7	7.7	7.7
Dec-2021	31.0	31.0	31.0	31.0	**31.0**
Feb (18th)-2022	0.0	0.0	0.0	0.0	0.0
Feb (26th)-2022	54.2	54.2	54.2	54.2	54.2
Mar-2022	170.6	**170.6**	**170.6**	170.6	170.6
Apr-2022	0.0	0.0	0.0	0.0	0.0
May-2022	7.8	7.8	7.8	7.8	7.8
Jun-2022	0.0	0.0	0.0	0.0	0.0
Jul-2022	**142.8**	142.8	142.8	142.8	142.8
Aug-2022	46.8	46.8	46.8	46.8	46.8
Sep-2022	276.7	276.7	276.7	276.7	276.7
MSP	**141.2**	**131.8**	**131.8**	**112.3**	**19.4**

*August is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

MacArthur Green

2.3.3.5 *Puffin*

Table 2-10. Puffin abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

	Puffin Abundance Estimate in the OAA	
Season	Breeding season (NatureScot)	Non-breeding season (NatureScot)
Jul-2020	914.3	914.3
Aug-2020	891.7	**891.7**
Sep-2020	124.0	124.0
Oct-2020	93.0	93.0
Nov-2020	0.0	0.0
Dec-2020	0.0	0.0
Jan-2021	0.0	0.0
Feb-2021	7.7	7.7
Mar-2021	0.0	0.0
Apr-2021	1016.0	1016.0
May-2021	116.3	116.3
Jun-2021	**3976.6**	3976.6
Jul-2021	1364.3	1364.3
Aug-2021*	1362.9	1362.9
Sep-2021	2154.0	**2154.0**
Oct-2021	178.3	178.3
Nov-2021	0.0	0.0
Dec-2021	7.7	7.7
Feb (18th)-2022	0.0	0.0
Feb (26th)-2022	0.0	0.0
Mar-2022	0.0	0.0
Apr-2022	1114.0	1114.0
May-2022	2965.8	2965.8
Jun-2022	**4444.5**	4444.5
Jul-2022	3426.4	3426.4
Aug-2022	2091.3	2091.3
Sep-2022	561.2	561.2
MSP	**4210.5**	**1522.8**

*August is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

Table 2-11. Puffin abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys (including unidentified auks apportioned using identified auk ratios and accounting for availability bias). Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Puffin Abundance Estimate in the OAA plus 2km buffer	
	Breeding season (NatureScot)	Non-breeding season (NatureScot)
Jul-2020	1604.1	1604.1
Aug-2020	1544.6	**1544.6**
Sep-2020	162.7	162.7
Oct-2020	116.3	116.3
Nov-2020	0.0	0.0
Dec-2020	0.0	0.0
Jan-2021	7.7	7.7
Feb-2021	7.7	7.7
Mar-2021	0.0	0.0
Apr-2021	1318.5	1318.5
May-2021	232.5	232.5
Jun-2021	**4930.0**	4930.0
Jul-2021	2201.5	2201.5
Aug-2021*	2021.1	2021.1
Sep-2021	2727.3	**2727.3**
Oct-2021	224.9	224.9
Nov-2021	0.0	0.0
Dec-2021	7.7	7.7
Feb (18th)-2022	0.0	0.0
Feb (26th)-2022	0.0	0.0
Mar-2022	0.0	0.0
Apr-2022	1392.5	1392.5
May-2022	4689.4	4689.4
Jun-2022	**5613.7**	5613.7
Jul-2022	5020.6	5020.6
Aug-2022	4424.5	4424.5
Sep-2022	640.3	640.3
MSP	**5271.9**	**2135.9**

*August is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

2.3.3.6 *Fulmar*

Table 2-12. Fulmar abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Fulmar Abundance Estimate in the OAA				
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)	Winter (BDMPS)
Jul-2020	473.2	473.2	473.2	473.2	473.2
Aug-2020	1504.8	1504.8	1504.8	1504.8	1504.8
Sep-2020	2742.5	**2742.5**	2742.5	**2742.5**	2742.5
Oct-2020	1163.1	1163.1	1163.1	1163.1	1163.1
Nov-2020	907.3	907.3	907.3	907.3	**907.3**
Dec-2020	1549.8	1549.8	**1549.8**	1549.8	1549.8
Jan-2021	1255.2	1255.2	1255.2	1255.2	1255.2
Feb-2021	178.1	178.1	178.1	178.1	178.1
Mar-2021	797.8	797.8	797.8	797.8	797.8
Apr-2021	294.7	294.7	294.7	294.7	294.7
May-2021	46.5	46.5	46.5	46.5	46.5
Jun-2021	0.0	0.0	0.0	0.0	0.0
Jul-2021	162.8	162.8	162.8	162.8	162.8
Aug-2021	**960.2**	960.2	960.2	960.2	960.2
Sep-2021*	588.9	588.9	588.9	588.9	588.9
Oct-2021	1426.7	1426.7	1426.7	**1426.7**	1426.7
Nov-2021	356.1	356.1	356.1	356.1	**356.1**
Dec-2021	1720.4	**1720.4**	**1720.4**	1720.4	1720.4
Feb (18th)-2022	751.7	751.7	751.7	751.7	751.7
Feb (26th)-2022	1014.7	1014.7	1014.7	1014.7	1014.7
Mar-2022	1582.0	1582.0	1582.0	1582.0	1582.0
Apr-2022	448.7	448.7	448.7	448.7	448.7
May-2022	124.2	124.2	124.2	124.2	124.2
Jun-2022	123.9	123.9	123.9	123.9	123.9
Jul-2022	388.6	388.6	388.6	388.6	388.6
Aug-2022	327.7	327.7	327.7	327.7	327.7
Sep-2022	**1367.5**	1367.5	1367.5	1367.5	1367.5
MSP	**1163.9**	**2231.5**	**1635.1**	**2084.6**	**631.7**

*September is a split month and could be used to calculate MSP for both breeding and non-breeding seasons

Table 2-13. Fulmar abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Fulmar Abundance Estimate in the OAA plus 2km				
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)	Winter (BDMPS)
Jul-2020	794.0	794.0	794.0	794.0	794.0
Aug-2020	1600.3	1600.3	1600.3	1600.3	1600.3
Sep-2020	3191.9	3191.9	3191.9	**3191.9**	3191.9
Oct-2020	1752.4	1752.4	1752.4	1752.4	1752.4
Nov-2020	1085.7	1085.7	1085.7	1085.7	**1085.7**
Dec-2020	3463.9	**3463.9**	**3463.9**	3463.9	3463.9
Jan-2021	1921.5	1921.5	1921.5	1921.5	1921.5
Feb-2021	302.1	302.1	302.1	302.1	302.1
Mar-2021	1099.8	1099.8	1099.8	1099.8	1099.8
Apr-2021	356.8	356.8	356.8	356.8	356.8
May-2021	240.3	240.3	240.3	240.3	240.3
Jun-2021	0.0	0.0	0.0	0.0	0.0
Jul-2021	201.5	201.5	201.5	201.5	201.5
Aug-2021	**1270.0**	1270.0	1270.0	1270.0	1270.0
Sep-2021*	759.3	759.3	759.3	759.3	759.3
Oct-2021	1690.4	1690.4	1690.4	**1690.4**	1690.4
Nov-2021	541.8	541.8	541.8	541.8	**541.8**
Dec-2021	2084.6	2084.6	2084.6	2084.6	2084.6
Feb (18th)-2022	1108.2	1108.2	1108.2	1108.2	1108.2
Feb (26th)-2022	1518.2	1518.2	1518.2	1518.2	1518.2
Mar-2022	2264.4	**2264.4**	**2264.4**	2264.4	2264.4
Apr-2022	541.5	541.5	541.5	541.5	541.5
May-2022	217.4	217.4	217.4	217.4	217.4
Jun-2022	170.3	170.3	170.3	170.3	170.3
Jul-2022	460.0	460.0	460.0	460.0	460.0
Aug-2022	444.8	444.8	444.8	444.8	444.8
Sep-2022	**1802.3**	1802.3	1802.3	1802.3	1802.3
MSP	**1536.1**	**2864.1**	**2864.1**	**2441.1**	**813.8**

*September is a split month and could be used to calculate MSP for both breeding and non-breeding seasons.

2.3.3.7 Gannet

Table 2-14. Gannet abundance estimates of all birds recorded in flight and on the sea in the OAA, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Gannet Abundance Estimate in the OAA			
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)
Jul-2020	360.9	360.9	360.9	360.9
Aug-2020	1926.7	1926.7	1926.7	1926.7
Sep-2020	999.4	999.4	999.4	**999.4**
Oct-2020	759.9	**759.9**	759.9	759.9
Nov-2020	7.8	7.8	7.8	7.8
Dec-2020	54.2	54.2	54.2	54.2
Jan-2021	23.2	23.2	23.2	23.2
Feb-2021	62.0	62.0	**62.0**	62.0
Mar-2021*	23.2	23.2	23.2	23.2
Apr-2021	263.7	263.7	263.7	263.7
May-2021	348.8	348.8	348.8	348.8
Jun-2021	170.5	170.5	170.5	170.5
Jul-2021	232.6	232.6	232.6	232.6
Aug-2021	495.6	495.6	495.6	495.6
Sep-2021	**681.8**	681.8	681.8	681.8
Oct-2021	1116.6	**1116.6**	1116.6	**1116.6**
Nov-2021	15.5	15.5	15.5	15.5
Dec-2021	7.7	7.7	7.7	7.7
Feb (18th)-2022	15.5	15.5	15.5	15.5
Feb (26th)-2022	69.7	69.7	69.7	69.7
Mar-2022*	147.3	147.3	**147.3**	147.3
Apr-2022	**626.6**	626.6	626.6	626.6
May-2022	155.3	155.3	155.3	155.3
Jun-2022	356.2	356.2	356.2	356.2
Jul-2022	349.0	349.0	349.0	349.0
Aug-2022	132.7	132.7	132.7	132.7
Sep-2022	339.9	339.9	339.9	339.9
MSP	**654.2**	**938.2**	**104.7**	**1058.0**

*March is a split month and could be used to calculate MSP for both breeding and non-breeding seasons.

Table 2-15. Gannet abundance estimates of all birds recorded in flight and on the sea in the OAA plus 2 km buffer, for each of the 27 monthly digital aerial surveys. Large bold numbers were used to calculate Mean Seasonal Peak (MSP) abundance for each season.

Season	Gannet Abundance Estimate in the OAA plus 2km buffer			
	Breeding season (NatureScot)	Non-breeding season (NatureScot)	Spring migration (BDMPS)	Autumn migration (BDMPS)
Jul-2020	433.1	433.1	433.1	433.1
Aug-2020	1974.5	1974.5	1974.5	1974.5
Sep-2020	1278.3	1278.3	1278.3	**1278.3**
Oct-2020	884.0	**884.0**	884.0	884.0
Nov-2020	23.3	23.3	23.3	23.3
Dec-2020	69.7	69.7	69.7	69.7
Jan-2021	31.0	31.0	31.0	31.0
Feb-2021	77.5	77.5	**77.5**	77.5
Mar-2021*	54.2	54.2	54.2	54.2
Apr-2021	395.6	395.6	395.6	395.6
May-2021	496.0	496.0	496.0	496.0
Jun-2021	240.3	240.3	240.3	240.3
Jul-2021	341.1	341.1	341.1	341.1
Aug-2021	689.2	689.2	689.2	689.2
Sep-2021	**891.0**	891.0	891.0	891.0
Oct-2021	1457.8	**1457.8**	1457.8	**1457.8**
Nov-2021	46.4	46.4	46.4	46.4
Dec-2021	15.5	15.5	15.5	15.5
Feb (18th)-2022	23.2	23.2	23.2	23.2
Feb (26th)-2022	77.5	77.5	77.5	77.5
Mar-2022*	201.6	201.6	**201.6**	201.6
Apr-2022	**812.3**	812.3	812.3	812.3
May-2022	256.2	256.2	256.2	256.2
Jun-2022	433.6	433.6	433.6	433.6
Jul-2022	428.3	428.3	428.3	428.3
Aug-2022	210.7	210.7	210.7	210.7
Sep-2022	537.5	537.5	537.5	537.5
MSP	**851.7**	**1170.9**	**139.5**	**1368.0**

*March is a split month and could be used to calculate MSP for both breeding and non-breeding seasons.

2.3.3.8 *MSP Summary*

Table 2-16 Summary of Mean Seasonal Peak (MSP) abundance calculations for all birds recorded in flight and on the sea in the OAA and the OAA plus 2 km buffer. MSPs are presented for each season.

Species	OAA		OAA plus 2km	
Season	Seasonal abundance peaks (survey date month/year)	MSP	Seasonal abundance peaks (survey date month/year)	MSP
Kittiwake				
Breeding season (NatureScot)	302.5 (Apr-21) 1395.9 (Jul-22)	849.2	496.4 (Apr-21) 1729.1 (Jul-22)	1112.7
Non-breeding season (NatureScot)	844.2 (Mar-21) 1,000.4 (Mar-22)	922.3	1,185.0 (Mar-21) 1,248.5 (Mar-22)	1,216.8
Spring migration (BDMPS)	844.2 (Mar-21) 1,000.4 (Mar-22)	922.3	1,185.0 (Mar-21) 1,248.5 (Mar-22)	1,216.8
Autumn migration (BDMPS)	666.8 (Oct-20) 504.0 (Oct-21)	585.4	1000.3 (Oct-20) 597.1 (Oct-21)	798.7
Arctic tern				
Breeding season (NatureScot)	178.3 (Jun-21) 70.2 (Aug-22)	124.3	178.3 (Jun-21) 70.2 (Aug-22)	124.3
Non-breeding season (NatureScot)	0.0 (Sep-20 to Apr-21) 0.0 (Sep-21 to Apr-22)	0.0	0.0 (Sep-20 to Apr-21) 0.0 (Sep-21 to Apr-22)	0.0
Spring migration (BDMPS)	0.0 (Apr-21 to May-21) 7.8 (May-22)	3.9	0.0 (Apr-21 to May-21) 7.8 (May-22)	3.9
Autumn migration (BDMPS)	0.0 (Jul 21 to Sep-21) 70.2 (Aug-22)	35.1	23.2 (Aug-21) 70.2 (Aug-22)	46.7
Guillemot				
Breeding season (NatureScot)	4762.2 (Apr-21) 5789.9 (Jul-22)	5276.1	6887.4 (Apr-21) 9057.7 (Jul-22)	7972.5
Non-breeding season (NatureScot)	3106.7 (Sep-20) 3285.2 (Sep-21)	3195.9	4516.7 (Sep-20) 4269.2 (Sep-21)	4392.9
Razorbill				
Breeding season (NatureScot)	123.9 (Aug-21) 95.2 (Jul-22)	109.5	139.6 (Apr-21) 142.8 (Jul-22)	141.2
Non-breeding season (NatureScot)	77.5 (Sep-20) 123.9 (Aug-21)	100.7	93.0 (Sep-20) 170.6 (Mar-22)	131.8
Spring migration (BDMPS)	62.0 (Feb-21) 100.8 (Mar-22)	81.4	92.9 (Feb-21) 170.6 (Mar-22)	131.8
Autumn migration (BDMPS)	77.5 (Sep-20) 123.9 (Aug-21)	100.7	93.0 (Sep-20) 131.6 (Aug-21)	112.3
Winter (BDMPS)	0 (Nov-20 to Dec-20) 15.5 (Dec-21)	7.7	7.8 (Nov-20) 31.0 (Dec-21)	19.4
Puffin				
Breeding season (NatureScot)	3976.6 (Jun-21) 4444.5 (Jun-22)	4210.5	4930.0 (Jun-21) 5613.7 (Jun-22)	5271.9

Species Season	OAA Seasonal abundance peaks (survey date month/year)	MSP	OAA plus 2km Seasonal abundance peaks (survey date month/year)	MSP
Non-breeding season (NatureScot)	891.7 (Aug-20) 2154.0 (Sep-21)	1522.8	1544.6 (Aug-20) 2727.3 (Sep-21)	2135.9
Fulmar				
Breeding season (NatureScot)	960.2 (Aug-21) 1367.5 (Sep-22)	1163.9	1270.0 (Aug-21) 1802.3 (Sep-22)	1536.1
Non-breeding season (NatureScot)	2742.5 (Sep-20) 1720.4 (Dec-21)	2231.5	3463.9 (Dec-20) 2264.4 (Mar-22)	2864.1
Spring migration (BDMPS)	1549.8 (Dec-20) 1720.4 (Dec-21)	1635.1	3463.9 (Dec-20) 2264.4 (Mar-22)	2864.1
Autumn migration (BDMPS)	2742.5 (Sep-20) 1426.7 (Oct-21)	2084.6	3191.9 (Sep-20) 1690.4 (Oct-21)	2441.1
Winter (BDMPS)	907.3 (Nov-20) 356.1 (Nov-21)	631.7	1085.7 (Nov-20) 541.8 (Nov-21)	813.8
Gannet				
Breeding season (NatureScot)	681.8 (Sep-21) 626.6 (Apr-22)	654.2	891.0 (Sep-21) 812.3 (Apr-22)	851.7
Non-breeding season (NatureScot)	759.9 (Oct-20) 1116.6 (Oct-21)	938.2	884.0 (Oct-20) 1457.8 (Oct-21)	1170.9
Spring migration (BDMPS)	62.0 (Feb-21) 147.3 (Mar-22)	104.7	77.5 (Feb-21) 201.6 (Mar-22)	139.5
Autumn migration (BDMPS)	999.4 (Sep-20) 1116.6 (Oct-21)	1058.0	1278.3 (Sep-20) 1457.8 (Oct-21)	1368.0

2.3.4 Displacement and mortality rates used for the impact assessment

NatureScot Guidance Note 8 (2023):

For displacement assessments using the matrix approach we advise that a range of displacement rates are presented in the tables, however, guide values to be used within the assessment are outlined in table 1.

We advise the adoption of a range of mortality figures, including consideration of potential seasonal differences.

NatureScot Consultation Letter (27 March 2024):

Advised that no 'medium' displacement scenario is required – just a high and a low scenario.

36. Following NatureScot Guidance Note 8, the matrix approach presents the full range of potential displacement (0-100%) and mortality impacts (0-100%) in each species-specific season.

37. Displacement and mortality rates used in the matrices for all seven species assessed for displacement impacts are presented in **Table 2-17**. NatureScot Guidance Note 8 was used to select the advised displacement and mortality percentages for kittiwake, guillemot, razorbill, puffin and gannet. Displacement and mortality values to use to estimate fulmar displacement mortality were advised by the RSPB during formal scoping consultation (26 May 2022). NatureScot advised (letter dated 5 April 2023) on the displacement and mortality rates to be used for Arctic tern which were based on disturbance-sensitivity indices as assessed by Bradbury *et al*. (2014).

38. As advised in the Joint SNCB Interim Displacement Advice Note (2022), the 'high' and 'low' displacement and mortality rates were highlighted dark green with rates surrounding these coloured light green to indicate the uncertainty around these figures.

Table 2-17. Displacement and mortality rates used for the displacement assessment, as advised in NatureScot's Guidance Note 8 and pre-application Project specific advice.

Species	Displacement Rate	Mortality Rate – Breeding Season	Mortality Rate – Non-breeding season
Kittiwake	30%	1% and 3%	1% and 3%
Arctic tern	30% to 50%	3%	N/A
Guillemot	60%	3% and 5%	1% and 3%
Razorbill	60%	3% and 5%	1% and 3%
Puffin	60%	3% and 5%	1% and 3%
Fulmar	20%	1% and 3%	1% and 3%
Gannet	70%	1% and 3%	1% and 3%

2.4 SeabORD modelling tool Approach

NatureScot Scoping Opinion (29 June 2022):

"For the displacement assessment, we currently advise use of SNCB (2017) matrix methods for auks in breeding and non-breeding seasons and the SeabORD tool (Searle et al., 2018) for species with tracking data in the breeding season"

NatureScot email advice (31 May 2023)

"We accept that there are some particular issues for West of Orkney Windfarm in using SeabORD for displacement assessments in advance of the release of SeabORD-R within the Cumulative Effects Framework (CEF). SeabORD-R will account for the competition effects of birds from other colonies through a 'global' or multi-colony map for the distribution of other relevant colonies.

In this specific instance we advise adopting an exceptional approach as set out below to run the current version of SeabORD to inform additional displacement assessments for guillemot and puffin during their chick-rearing periods. This uses our apportioning approach to consider the relative importance of the seven SPA colonies listed to these two species, their distances from the development and notes that bird distributions within the larger sites is not uniform (Table 1: Population figures are citation populations).

Table 1 Population figures are citation populations

SPA	Distance km	Area (ha)	Guillemots	Puffins
North Caithness Cliffs	27.2	14,629	38,300 inds	2,080 pairs
Sule Skerry and Sule Stack	1.7	17 (S. Skerry)	6,300 inds	46,900 pairs
Hoy	24.7	18,122 incl moorland	13,400 pairs	3,500 pairs
Marwick Head	35.0	476	37,700 inds	n/a
Rousay	49.3	5,483 incl moorland	10,600 inds	n/a
West Westray	60.2	3,781 incl moorland	42,150 inds	SSSI feature <200 inds
Cape Wrath		6,737	13,700 inds	5,900 pairs

NatureScot email advice (31 May 2023) cont

We advise that:

- *The apportioned results of the matrix approach for the chick-rearing period is first used to indicate the potential relative displacement impacts for each species within each of the relevant listed SPAs.*
- *These results should then be used to inform a reasoned judgement as to which SPA populations should be included within the supplementary SeabORD assessments.*
- *Depending on the overall number of SPAs, their linear dimensions and distributions of guillemots or puffins within them, up to 6 'colonies' across the selected SPAs should then be considered within SeabORD. Note that we would anticipate that the centre of Sule Skerry be used as single point 'colony' for Sule Skerry and Sule Stack SPA and similarly that a single mid-point be adopted for Marwick Head SPA, if included in SeabORD assessments. For the other SPAs, the choice of one or more 'colony' locations (depending on the total number of SPAs to be included), should be informed by distribution of the species within the relevant SPAs. This means, for instance, that we would not anticipate as many as five separate locations being identified within the North Caithness Cliffs SPA for use in the model in this instance."*

39. As recommended by NatureScot, SeabORD (Searle *et al.* 2018) was used to model displacement effects on guillemot and puffin survival and productivity.

40. Full details of the SeabORD methodology used are presented in **Annex 4A: SeabORD Analysis Final Report**. In summary, the approach taken was as followed:

- modelled 20% of the guillemot population and 10% of the puffin population of each SPA colony;
- the model region was based on the mean of the maximum foraging range plus one standard deviation plus 5%;
- foraging location was based on the distance decay method, with 95% of foraging within the foraging range (mean max foraging range plus 1SD);
- assumed that prey were uniformly distributed in space;
- assumed that 60% of birds would be displaced from the offshore Project footprint plus a 2 km buffer;
- assumed that 100% of birds that would have crossed the offshore Project would experience barrier effects (i.e. all bird would fly around the windfarm for the duration of the offshore Project); and
- assumed that birds are displaced into a 5 km buffer around the Project footprint plus a 2 km buffer.

41. Following consultation with NatureScot (email dated 31 May 2023), the SeabORD model was run on guillemot and puffin colonies where there was a predicted impact from the Project alone, that had the potential to be significant. The following SPA colonies were run in the model for guillemot:

- North Caithness Cliffs;
- Sule Skerry and Sule Stack;
- Hoy;
- Marwick Head;
- Rousay;
- Cape Wrath; and
- West Westray.

42. For puffin, four SPAs were assessed for displacement effects using SeabORD. These were:

- North Caithness Cliffs;
- Sule Skerry and Sule Stack;
- Hoy; and
- Cape Wrath.

3 RESULTS

3.1 Individual species accounts using displacement matrices

43. The displacement matrices provide, for each species and season, the estimated mortality of birds predicted to occur due to displacement, as determined by the assumed rates of displacement and mortality, as specified in **Table 2-17**.

44. Displacement matrices for each species, in each season and using mean seasonal peak abundances from both the OAA and the OAA plus a 2 km buffer, are presented in **Table 3-1** to **Table 3-50**.

45. Each cell presents potential bird mortality following displacement from the Project during a species-specific season given the following:

    i) the MSP abundance within the OAA or the OAA plus 2km buffer (**Table 2-16**);

    ii) the percentage of the MSP abundance assumed to be displaced (**Table 2-17**); and,

    iii) the assumed percentage mortality of the displaced birds (**Table 2-17**).

46. The outputs highlighted in dark green are those based on the displacement and mortality rates in **Table 2-17**. Outputs highlighted in light green incidate uncertainty around the assumed displacement and mortality rates, as advised by the SNCB (2022).

3.1.1 Kittiwake

47. Kittiwake seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-1** to **Table 3-8**. The highest displacement impact ('high' impact scenario of 30% displacement and 3% mortality) predicted a displacement mortality of 11 kittiwakes in the OAA plus 2 km buffer during the non-breeding season as well as the BDMPS spring migration. During the breeding season, the highest impact scenario predicted a displacement mortality of 10 birds in the OAA plus 2 km buffer, the smallest displacement mortality of 7.2 kittiwakes was predicted in the autumn migration season in the same area.

3.1.1.1 Kittiwake – Breeding season

Table 3-1. Potential kittiwake mortality following displacement from the OAA in the breeding season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

MORTALITY \ DISPLACEMENT	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.8	1.7	2.5	3.4	4.2	5.1	5.9	6.8	7.6	8.5
2%	0.0	1.7	3.4	5.1	6.8	8.5	10.2	11.9	13.6	15.3	17.0
3%	0.0	2.5	5.1	7.6	10.2	12.7	15.3	17.8	20.4	22.9	25.5
4%	0.0	3.4	6.8	10.2	13.6	17.0	20.4	23.8	27.2	30.6	34.0
5%	0.0	4.2	8.5	12.7	17.0	21.2	25.5	29.7	34.0	38.2	42.5
10%	0.0	8.5	17.0	25.5	34.0	42.5	51.0	59.4	67.9	76.4	84.9
15%	0.0	12.7	25.5	38.2	51.0	63.7	76.4	89.2	101.9	114.6	127.4
20%	0.0	17.0	34.0	51.0	67.9	84.9	101.9	118.9	135.9	152.9	169.8
30%	0.0	25.5	51.0	76.4	101.9	127.4	152.9	178.3	203.8	229.3	254.8
40%	0.0	34.0	67.9	101.9	135.9	169.8	203.8	237.8	271.7	305.7	339.7
50%	0.0	42.5	84.9	127.4	169.8	212.3	254.8	297.2	339.7	382.1	424.6
60%	0.0	51.0	101.9	152.9	203.8	254.8	305.7	356.7	407.6	458.6	509.5
70%	0.0	59.4	118.9	178.3	237.8	297.2	356.7	416.1	475.6	535.0	594.4
80%	0.0	67.9	135.9	203.8	271.7	339.7	407.6	475.6	543.5	611.4	679.4
90%	0.0	76.4	152.9	229.3	305.7	382.1	458.6	535.0	611.4	687.9	764.3
100%	0.0	84.9	169.8	254.8	339.7	424.6	509.5	594.4	679.4	764.3	849.2

Table 3-2. Potential kittiwake mortality following displacement from the OAA plus 2 km buffer in the breeding season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

MORTALITY \ DISPLACEMENT	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	1.1	2.2	3.3	4.5	5.6	6.7	7.8	8.9	10.0	11.1
2%	0.0	2.2	4.5	6.7	8.9	11.1	13.4	15.6	17.8	20.0	22.3
3%	0.0	3.3	6.7	10.0	13.4	16.7	20.0	23.4	26.7	30.0	33.4
4%	0.0	4.5	8.9	13.4	17.8	22.3	26.7	31.2	35.6	40.1	44.5
5%	0.0	5.6	11.1	16.7	22.3	27.8	33.4	38.9	44.5	50.1	55.6
10%	0.0	11.1	22.3	33.4	44.5	55.6	66.8	77.9	89.0	100.1	111.3
15%	0.0	16.7	33.4	50.1	66.8	83.5	100.1	116.8	133.5	150.2	166.9
20%	0.0	22.3	44.5	66.8	89.0	111.3	133.5	155.8	178.0	200.3	222.5
30%	0.0	33.4	66.8	100.1	133.5	166.9	200.3	233.7	267.1	300.4	333.8
40%	0.0	44.5	89.0	133.5	178.0	222.5	267.1	311.6	356.1	400.6	445.1
50%	0.0	55.6	111.3	166.9	222.5	278.2	333.8	389.5	445.1	500.7	556.4
60%	0.0	66.8	133.5	200.3	267.1	333.8	400.6	467.3	534.1	600.9	667.6
70%	0.0	77.9	155.8	233.7	311.6	389.5	467.3	545.2	623.1	701.0	778.9
80%	0.0	89.0	178.0	267.1	356.1	445.1	534.1	623.1	712.1	801.2	890.2
90%	0.0	100.1	200.3	300.4	400.6	500.7	600.9	701.0	801.2	901.3	1001.4
100%	0.0	111.3	222.5	333.8	445.1	556.4	667.6	778.9	890.2	1001.4	1112.7

3.1.1.2 *Kittiwake – Non-breeding season*

Table 3-3. Potential kittiwake mortality following displacement from the OAA in the non-breeding season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.9	1.8	2.8	3.7	4.6	5.5	6.5	7.4	8.3	9.2
2%	0.0	1.8	3.7	5.5	7.4	9.2	11.1	12.9	14.8	16.6	18.4
3%	0.0	2.8	5.5	8.3	11.1	13.8	16.6	19.4	22.1	24.9	27.7
4%	0.0	3.7	7.4	11.1	14.8	18.4	22.1	25.8	29.5	33.2	36.9
5%	0.0	4.6	9.2	13.8	18.4	23.1	27.7	32.3	36.9	41.5	46.1
10%	0.0	9.2	18.4	27.7	36.9	46.1	55.3	64.6	73.8	83.0	92.2
15%	0.0	13.8	27.7	41.5	55.3	69.2	83.0	96.8	110.7	124.5	138.3
20%	0.0	18.4	36.9	55.3	73.8	92.2	110.7	129.1	147.6	166.0	184.5
30%	0.0	27.7	55.3	83.0	110.7	138.3	166.0	193.7	221.4	249.0	276.7
40%	0.0	36.9	73.8	110.7	147.6	184.5	221.4	258.2	295.1	332.0	368.9
50%	0.0	46.1	92.2	138.3	184.5	230.6	276.7	322.8	368.9	415.0	461.2
60%	0.0	55.3	110.7	166.0	221.4	276.7	332.0	387.4	442.7	498.0	553.4
70%	0.0	64.6	129.1	193.7	258.2	322.8	387.4	451.9	516.5	581.1	645.6
80%	0.0	73.8	147.6	221.4	295.1	368.9	442.7	516.5	590.3	664.1	737.8
90%	0.0	83.0	166.0	249.0	332.0	415.0	498.0	581.1	664.1	747.1	830.1
100%	0.0	92.2	184.5	276.7	368.9	461.2	553.4	645.6	737.8	830.1	922.3

Table 3-4. Potential kittiwake mortality following displacement from the OAA plus 2 km buffer in the non-breeding season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	1.2	2.4	3.7	4.9	6.1	7.3	8.5	9.7	11.0	12.2
2%	0.0	2.4	4.9	7.3	9.7	12.2	14.6	17.0	19.5	21.9	24.3
3%	0.0	3.7	7.3	11.0	14.6	18.3	21.9	25.6	29.2	32.9	36.5
4%	0.0	4.9	9.7	14.6	19.5	24.3	29.2	34.1	38.9	43.8	48.7
5%	0.0	6.1	12.2	18.3	24.3	30.4	36.5	42.6	48.7	54.8	60.8
10%	0.0	12.2	24.3	36.5	48.7	60.8	73.0	85.2	97.3	109.5	121.7
15%	0.0	18.3	36.5	54.8	73.0	91.3	109.5	127.8	146.0	164.3	182.5
20%	0.0	24.3	48.7	73.0	97.3	121.7	146.0	170.3	194.7	219.0	243.4
30%	0.0	36.5	73.0	109.5	146.0	182.5	219.0	255.5	292.0	328.5	365.0
40%	0.0	48.7	97.3	146.0	194.7	243.4	292.0	340.7	389.4	438.0	486.7
50%	0.0	60.8	121.7	182.5	243.4	304.2	365.0	425.9	486.7	547.6	608.4
60%	0.0	73.0	146.0	219.0	292.0	365.0	438.0	511.0	584.1	657.1	730.1
70%	0.0	85.2	170.3	255.5	340.7	425.9	511.0	596.2	681.4	766.6	851.7
80%	0.0	97.3	194.7	292.0	389.4	486.7	584.1	681.4	778.7	876.1	973.4
90%	0.0	109.5	219.0	328.5	438.0	547.6	657.1	766.6	876.1	985.6	1095.1
100%	0.0	121.7	243.4	365.0	486.7	608.4	730.1	851.7	973.4	1095.1	1216.8

3.1.1.3 *Kittiwake – Spring migration*

Table 3-5. Potential kittiwake mortality following displacement from the OAA in the spring migration season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.9	1.8	2.8	3.7	4.6	5.5	6.5	7.4	8.3	9.2
2%	0.0	1.8	3.7	5.5	7.4	9.2	11.1	12.9	14.8	16.6	18.4
3%	0.0	2.8	5.5	8.3	11.1	13.8	16.6	19.4	22.1	24.9	27.7
4%	0.0	3.7	7.4	11.1	14.8	18.4	22.1	25.8	29.5	33.2	36.9
5%	0.0	4.6	9.2	13.8	18.4	23.1	27.7	32.3	36.9	41.5	46.1
10%	0.0	9.2	18.4	27.7	36.9	46.1	55.3	64.6	73.8	83.0	92.2
15%	0.0	13.8	27.7	41.5	55.3	69.2	83.0	96.8	110.7	124.5	138.3
20%	0.0	18.4	36.9	55.3	73.8	92.2	110.7	129.1	147.6	166.0	184.5
30%	0.0	27.7	55.3	83.0	110.7	138.3	166.0	193.7	221.4	249.0	276.7
40%	0.0	36.9	73.8	110.7	147.6	184.5	221.4	258.2	295.1	332.0	368.9
50%	0.0	46.1	92.2	138.3	184.5	230.6	276.7	322.8	368.9	415.0	461.2
60%	0.0	55.3	110.7	166.0	221.4	276.7	332.0	387.4	442.7	498.0	553.4
70%	0.0	64.6	129.1	193.7	258.2	322.8	387.4	451.9	516.5	581.1	645.6
80%	0.0	73.8	147.6	221.4	295.1	368.9	442.7	516.5	590.3	664.1	737.8
90%	0.0	83.0	166.0	249.0	332.0	415.0	498.0	581.1	664.1	747.1	830.1
100%	0.0	92.2	184.5	276.7	368.9	461.2	553.4	645.6	737.8	830.1	922.3

Table 3-6. Potential kittiwake mortality following displacement from OAA plus 2 km buffer in the spring migration season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	1.2	2.4	3.7	4.9	6.1	7.3	8.5	9.7	11.0	12.2
2%	0.0	2.4	4.9	7.3	9.7	12.2	14.6	17.0	19.5	21.9	24.3
3%	0.0	3.7	7.3	11.0	14.6	18.3	21.9	25.6	29.2	32.9	36.5
4%	0.0	4.9	9.7	14.6	19.5	24.3	29.2	34.1	38.9	43.8	48.7
5%	0.0	6.1	12.2	18.3	24.3	30.4	36.5	42.6	48.7	54.8	60.8
10%	0.0	12.2	24.3	36.5	48.7	60.8	73.0	85.2	97.3	109.5	121.7
15%	0.0	18.3	36.5	54.8	73.0	91.3	109.5	127.8	146.0	164.3	182.5
20%	0.0	24.3	48.7	73.0	97.3	121.7	146.0	170.3	194.7	219.0	243.4
30%	0.0	36.5	73.0	109.5	146.0	182.5	219.0	255.5	292.0	328.5	365.0
40%	0.0	48.7	97.3	146.0	194.7	243.4	292.0	340.7	389.4	438.0	486.7
50%	0.0	60.8	121.7	182.5	243.4	304.2	365.0	425.9	486.7	547.6	608.4
60%	0.0	73.0	146.0	219.0	292.0	365.0	438.0	511.0	584.1	657.1	730.1
70%	0.0	85.2	170.3	255.5	340.7	425.9	511.0	596.2	681.4	766.6	851.7
80%	0.0	97.3	194.7	292.0	389.4	486.7	584.1	681.4	778.7	876.1	973.4
90%	0.0	109.5	219.0	328.5	438.0	547.6	657.1	766.6	876.1	985.6	1095.1
100%	0.0	121.7	243.4	365.0	486.7	608.4	730.1	851.7	973.4	1095.1	1216.8

3.1.1.4 *Kittiwake – Autumn migration*

Table 3-7. Potential kittiwake mortality following displacement from the OAA in the autumn migration season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.6	1.2	1.8	2.3	2.9	3.5	4.1	4.7	5.3	5.9
2%	0.0	1.2	2.3	3.5	4.7	5.9	7.0	8.2	9.4	10.5	11.7
3%	0.0	1.8	3.5	5.3	7.0	8.8	10.5	12.3	14.1	15.8	17.6
4%	0.0	2.3	4.7	7.0	9.4	11.7	14.1	16.4	18.7	21.1	23.4
5%	0.0	2.9	5.9	8.8	11.7	14.6	17.6	20.5	23.4	26.3	29.3
10%	0.0	5.9	11.7	17.6	23.4	29.3	35.1	41.0	46.8	52.7	58.5
15%	0.0	8.8	17.6	26.3	35.1	43.9	52.7	61.5	70.3	79.0	87.8
20%	0.0	11.7	23.4	35.1	46.8	58.5	70.3	82.0	93.7	105.4	117.1
30%	0.0	17.6	35.1	52.7	70.3	87.8	105.4	122.9	140.5	158.1	175.6
40%	0.0	23.4	46.8	70.3	93.7	117.1	140.5	163.9	187.3	210.8	234.2
50%	0.0	29.3	58.5	87.8	117.1	146.4	175.6	204.9	234.2	263.4	292.7
60%	0.0	35.1	70.3	105.4	140.5	175.6	210.8	245.9	281.0	316.1	351.3
70%	0.0	41.0	82.0	122.9	163.9	204.9	245.9	286.9	327.8	368.8	409.8
80%	0.0	46.8	93.7	140.5	187.3	234.2	281.0	327.8	374.7	421.5	468.3
90%	0.0	52.7	105.4	158.1	210.8	263.4	316.1	368.8	421.5	474.2	526.9
100%	0.0	58.5	117.1	175.6	234.2	292.7	351.3	409.8	468.3	526.9	585.4

Table 3-8. Potential kittiwake mortality following displacement from the OAA plus 2 km buffer in the autumn migration season.

Low = 30% displacement and 1% mortality. High = 30% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0
2%	0.0	1.6	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.4	16.0
3%	0.0	2.4	4.8	7.2	9.6	12.0	14.4	16.8	19.2	21.6	24.0
4%	0.0	3.2	6.4	9.6	12.8	16.0	19.2	22.4	25.6	28.8	31.9
5%	0.0	4.0	8.0	12.0	16.0	20.0	24.0	28.0	31.9	35.9	39.9
10%	0.0	8.0	16.0	24.0	31.9	39.9	47.9	55.9	63.9	71.9	79.9
15%	0.0	12.0	24.0	35.9	47.9	59.9	71.9	83.9	95.8	107.8	119.8
20%	0.0	16.0	31.9	47.9	63.9	79.9	95.8	111.8	127.8	143.8	159.7
30%	0.0	24.0	47.9	71.9	95.8	119.8	143.8	167.7	191.7	215.6	239.6
40%	0.0	31.9	63.9	95.8	127.8	159.7	191.7	223.6	255.6	287.5	319.5
50%	0.0	39.9	79.9	119.8	159.7	199.7	239.6	279.5	319.5	359.4	399.3
60%	0.0	47.9	95.8	143.8	191.7	239.6	287.5	335.4	383.4	431.3	479.2
70%	0.0	55.9	111.8	167.7	223.6	279.5	335.4	391.3	447.2	503.2	559.1
80%	0.0	63.9	127.8	191.7	255.6	319.5	383.4	447.2	511.1	575.0	638.9
90%	0.0	71.9	143.8	215.6	287.5	359.4	431.3	503.2	575.0	646.9	718.8
100%	0.0	79.9	159.7	239.6	319.5	399.3	479.2	559.1	638.9	718.8	798.7

3.1.2 Arctic tern

48. Arctic tern seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-9** to **Table 3-14**. The highest displacement impact ('high' impact scenario of 50% displacement and 3% mortality) predicted a displacement mortality of 1.9 Arctic terns in the OAA as well as the OAA plus 2 km buffer, during the breeding season. Displacement mortality predicted in the BDMPS spring and

autumn migration periods was less than one bird; a mortality of 0.1 and 0.7 Arctic terns in each migration period respectively was predicted in the OAA plus 2 km buffer.

3.1.2.1 Arctic tern – Breeding season

Table 3-9. Potential Arctic tern mortality following displacement from the OAA in the breeding season.

Low = 30% displacement and 3% mortality. High = 50% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2
2%	0.0	0.2	0.5	0.7	1.0	1.2	1.5	1.7	2.0	2.2	2.5
3%	0.0	0.4	0.7	1.1	1.5	1.9	2.2	2.6	3.0	3.4	3.7
4%	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
5%	0.0	0.6	1.2	1.9	2.5	3.1	3.7	4.3	5.0	5.6	6.2
10%	0.0	1.2	2.5	3.7	5.0	6.2	7.5	8.7	9.9	11.2	12.4
15%	0.0	1.9	3.7	5.6	7.5	9.3	11.2	13.0	14.9	16.8	18.6
20%	0.0	2.5	5.0	7.5	9.9	12.4	14.9	17.4	19.9	22.4	24.9
30%	0.0	3.7	7.5	11.2	14.9	18.6	22.4	26.1	29.8	33.5	37.3
40%	0.0	5.0	9.9	14.9	19.9	24.9	29.8	34.8	39.8	44.7	49.7
50%	0.0	6.2	12.4	18.6	24.9	31.1	37.3	43.5	49.7	55.9	62.1
60%	0.0	7.5	14.9	22.4	29.8	37.3	44.7	52.2	59.6	67.1	74.6
70%	0.0	8.7	17.4	26.1	34.8	43.5	52.2	60.9	69.6	78.3	87.0
80%	0.0	9.9	19.9	29.8	39.8	49.7	59.6	69.6	79.5	89.5	99.4
90%	0.0	11.2	22.4	33.5	44.7	55.9	67.1	78.3	89.5	100.6	111.8
100%	0.0	12.4	24.9	37.3	49.7	62.1	74.6	87.0	99.4	111.8	124.3

Table 3-10. Potential Arctic tern mortality following displacement from the OAA plus 2 km buffer in the breeding season.

Low = 30% displacement and 3% mortality. High = 50% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2
2%	0.0	0.2	0.5	0.7	1.0	1.2	1.5	1.7	2.0	2.2	2.5
3%	0.0	0.4	0.7	1.1	1.5	1.9	2.2	2.6	3.0	3.4	3.7
4%	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
5%	0.0	0.6	1.2	1.9	2.5	3.1	3.7	4.3	5.0	5.6	6.2
10%	0.0	1.2	2.5	3.7	5.0	6.2	7.5	8.7	9.9	11.2	12.4
15%	0.0	1.9	3.7	5.6	7.5	9.3	11.2	13.0	14.9	16.8	18.6
20%	0.0	2.5	5.0	7.5	9.9	12.4	14.9	17.4	19.9	22.4	24.9
30%	0.0	3.7	7.5	11.2	14.9	18.6	22.4	26.1	29.8	33.5	37.3
40%	0.0	5.0	9.9	14.9	19.9	24.9	29.8	34.8	39.8	44.7	49.7
50%	0.0	6.2	12.4	18.6	24.9	31.1	37.3	43.5	49.7	55.9	62.1
60%	0.0	7.5	14.9	22.4	29.8	37.3	44.7	52.2	59.6	67.1	74.6
70%	0.0	8.7	17.4	26.1	34.8	43.5	52.2	60.9	69.6	78.3	87.0
80%	0.0	9.9	19.9	29.8	39.8	49.7	59.6	69.6	79.5	89.5	99.4
90%	0.0	11.2	22.4	33.5	44.7	55.9	67.1	78.3	89.5	100.6	111.8
100%	0.0	12.4	24.9	37.3	49.7	62.1	74.6	87.0	99.4	111.8	124.3

3.1.2.2 *Arctic tern – Spring migration*

Table 3-11. Potential Arctic tern mortality following displacement from the OAA in the spring migration season.

Low = 30% displacement and 3% mortality. High = 50% displacement and 3% mortality.

		DISPLACEMENT										
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
	3%	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
	4%	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2
	5%	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
	10%	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4
	15%	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6
	20%	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8
	30%	0.0	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.2
	40%	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.6
	50%	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.7	1.9
	60%	0.0	0.2	0.5	0.7	0.9	1.2	1.4	1.6	1.9	2.1	2.3
	70%	0.0	0.3	0.5	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7
	80%	0.0	0.3	0.6	0.9	1.2	1.6	1.9	2.2	2.5	2.8	3.1
	90%	0.0	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.5
	100%	0.0	0.4	0.8	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.9

Table 3-12. Potential Arctic tern mortality following displacement from the OAA plus 2 km buffer in the spring migration season.

Low = 30% displacement and 3% mortality. High = 50% displacement and 3% mortality.

		DISPLACEMENT										
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
	3%	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
	4%	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2
	5%	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
	10%	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4
	15%	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6
	20%	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8
	30%	0.0	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.2
	40%	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.6
	50%	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.7	1.9
	60%	0.0	0.2	0.5	0.7	0.9	1.2	1.4	1.6	1.9	2.1	2.3
	70%	0.0	0.3	0.5	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7
	80%	0.0	0.3	0.6	0.9	1.2	1.6	1.9	2.2	2.5	2.8	3.1
	90%	0.0	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.5
	100%	0.0	0.4	0.8	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.9

3.1.2.3 Arctic tern – Autumn migration

Table 3-13. Potential Arctic tern mortality following displacement from OAA in the autumn migration season.

Low = 30% displacement and 3% mortality. High = 50% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4
2%	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7
3%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.1
4%	0.0	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.4
5%	0.0	0.2	0.4	0.5	0.7	0.9	1.1	1.2	1.4	1.6	1.8
10%	0.0	0.4	0.7	1.1	1.4	1.8	2.1	2.5	2.8	3.2	3.5
15%	0.0	0.5	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.7	5.3
20%	0.0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0
30%	0.0	1.1	2.1	3.2	4.2	5.3	6.3	7.4	8.4	9.5	10.5
40%	0.0	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6	14.0
50%	0.0	1.8	3.5	5.3	7.0	8.8	10.5	12.3	14.0	15.8	17.6
60%	0.0	2.1	4.2	6.3	8.4	10.5	12.6	14.7	16.9	19.0	21.1
70%	0.0	2.5	4.9	7.4	9.8	12.3	14.7	17.2	19.7	22.1	24.6
80%	0.0	2.8	5.6	8.4	11.2	14.0	16.9	19.7	22.5	25.3	28.1
90%	0.0	3.2	6.3	9.5	12.6	15.8	19.0	22.1	25.3	28.4	31.6
100%	0.0	3.5	7.0	10.5	14.0	17.6	21.1	24.6	28.1	31.6	35.1

Table 3-14. Potential Arctic tern mortality following displacement from OAA plus 2 km buffer in the autumn migration season.

Low = 30% displacement and 3% mortality. High = 50% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5
2%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.9
3%	0.0	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.4
4%	0.0	0.2	0.4	0.6	0.7	0.9	1.1	1.3	1.5	1.7	1.9
5%	0.0	0.2	0.5	0.7	0.9	1.2	1.4	1.6	1.9	2.1	2.3
10%	0.0	0.5	0.9	1.4	1.9	2.3	2.8	3.3	3.7	4.2	4.7
15%	0.0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0
20%	0.0	0.9	1.9	2.8	3.7	4.7	5.6	6.5	7.5	8.4	9.3
30%	0.0	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6	14.0
40%	0.0	1.9	3.7	5.6	7.5	9.3	11.2	13.1	15.0	16.8	18.7
50%	0.0	2.3	4.7	7.0	9.3	11.7	14.0	16.4	18.7	21.0	23.4
60%	0.0	2.8	5.6	8.4	11.2	14.0	16.8	19.6	22.4	25.2	28.0
70%	0.0	3.3	6.5	9.8	13.1	16.4	19.6	22.9	26.2	29.4	32.7
80%	0.0	3.7	7.5	11.2	15.0	18.7	22.4	26.2	29.9	33.6	37.4
90%	0.0	4.2	8.4	12.6	16.8	21.0	25.2	29.4	33.6	37.9	42.1
100%	0.0	4.7	9.3	14.0	18.7	23.4	28.0	32.7	37.4	42.1	46.7

3.1.3 Guillemot

49. Guillemot seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-15** to **Table 3-18**. The highest displacement impact ('high' impact scenario of 60% displacement and 5% mortality) predicted a displacement mortality of 239 guillemots in the OAA plus 2 km buffer during the breeding season. During the non-breeding season, the highest displacement ('high' impact of 60% displacement and 3% mortality) impact predicted a displacement mortality of 79 birds in the OAA plus 2 km buffer.

3.1.3.1 Guillemot– Breeding season

Table 3-15. Potential guillemot mortality following displacement from the OAA in the breeding season.

Low = 60% displacement and 3% mortality. High = 60% displacement and 5% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	5.3	10.6	15.8	21.1	26.4	31.7	36.9	42.2	47.5	52.8
2%	0.0	10.6	21.1	31.7	42.2	52.8	63.3	73.9	84.4	95.0	105.5
3%	0.0	15.8	31.7	47.5	63.3	79.1	95.0	110.8	126.6	142.5	158.3
4%	0.0	21.1	42.2	63.3	84.4	105.5	126.6	147.7	168.8	189.9	211.0
5%	0.0	26.4	52.8	79.1	105.5	131.9	158.3	184.7	211.0	237.4	263.8
10%	0.0	52.8	105.5	158.3	211.0	263.8	316.6	369.3	422.1	474.8	527.6
15%	0.0	79.1	158.3	237.4	316.6	395.7	474.8	554.0	633.1	712.3	791.4
20%	0.0	105.5	211.0	316.6	422.1	527.6	633.1	738.6	844.2	949.7	1055.2
30%	0.0	158.3	316.6	474.8	633.1	791.4	949.7	1108.0	1266.3	1424.5	1582.8
40%	0.0	211.0	422.1	633.1	844.2	1055.2	1266.3	1477.3	1688.3	1899.4	2110.4
50%	0.0	263.8	527.6	791.4	1055.2	1319.0	1582.8	1846.6	2110.4	2374.2	2638.0
60%	0.0	316.6	633.1	949.7	1266.3	1582.8	1899.4	2215.9	2532.5	2849.1	3165.6
70%	0.0	369.3	738.6	1108.0	1477.3	1846.6	2215.9	2585.3	2954.6	3323.9	3693.2
80%	0.0	422.1	844.2	1266.3	1688.3	2110.4	2532.5	2954.6	3376.7	3798.8	4220.9
90%	0.0	474.8	949.7	1424.5	1899.4	2374.2	2849.1	3323.9	3798.8	4273.6	4748.5
100%	0.0	527.6	1055.2	1582.8	2110.4	2638.0	3165.6	3693.2	4220.9	4748.5	5276.1

Table 3-16. Potential guillemot mortality following displacement from the OAA plus 2 km buffer in the breeding season.

Low = 60% displacement and 3% mortality. High = 60% displacement and 5% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	0.0	0.0	0.0	0.0	19.9	23.9	27.9	0.0	0.0	0.0
1%	0.0	8.0	15.9	23.9	31.9	39.9	47.8	55.8	63.8	71.8	79.7
2%	0.0	15.9	31.9	47.8	63.8	79.7	95.7	111.6	127.6	143.5	159.5
3%	0.0	23.9	47.8	71.8	95.7	119.6	143.5	167.4	191.3	215.3	239.2
4%	0.0	31.9	63.8	95.7	127.6	159.5	191.3	223.2	255.1	287.0	318.9
5%	0.0	39.9	79.7	119.6	159.5	199.3	239.2	279.0	318.9	358.8	398.6
10%	0.0	79.7	159.5	239.2	318.9	398.6	478.4	558.1	637.8	717.5	797.3
15%	0.0	119.6	239.2	358.8	478.4	597.9	717.5	837.1	956.7	1076.3	1195.9
20%	0.0	159.5	318.9	478.4	637.8	797.3	956.7	1116.2	1275.6	1435.1	1594.5
30%	0.0	239.2	478.4	717.5	956.7	1195.9	1435.1	1674.2	1913.4	2152.6	2391.8
40%	0.0	318.9	637.8	956.7	1275.6	1594.5	1913.4	2232.3	2551.2	2870.1	3189.0
50%	0.0	398.6	797.3	1195.9	1594.5	1993.1	2391.8	2790.4	3189.0	3587.6	3986.3
60%	0.0	478.4	956.7	1435.1	1913.4	2391.8	2870.1	3348.5	3826.8	4305.2	4783.5
70%	0.0	558.1	1116.2	1674.2	2232.3	2790.4	3348.5	3906.5	4464.6	5022.7	5580.8
80%	0.0	637.8	1275.6	1913.4	2551.2	3189.0	3826.8	4464.6	5102.4	5740.2	6378.0

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
90%	0.0	717.5	1435.1	2152.6	2870.1	3587.6	4305.2	5022.7	5740.2	6457.7	7175.3
100%	0.0	797.3	1594.5	2391.8	3189.0	3986.3	4783.5	5580.8	6378.0	7175.3	7972.5

3.1.3.2 *Guillemot – Non-breeding season*

Table 3-17. Potential guillemot mortality following displacement from the OAA in the non-breeding season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	3.2	6.4	9.6	12.8	16.0	19.2	22.4	25.6	28.8	32.0
2%	0.0	6.4	12.8	19.2	25.6	32.0	38.4	44.7	51.1	57.5	63.9
3%	0.0	9.6	19.2	28.8	38.4	47.9	57.5	67.1	76.7	86.3	95.9
4%	0.0	12.8	25.6	38.4	51.1	63.9	76.7	89.5	102.3	115.1	127.8
5%	0.0	16.0	32.0	47.9	63.9	79.9	95.9	111.9	127.8	143.8	159.8
10%	0.0	32.0	63.9	95.9	127.8	159.8	191.8	223.7	255.7	287.6	319.6
15%	0.0	47.9	95.9	143.8	191.8	239.7	287.6	335.6	383.5	431.4	479.4
20%	0.0	63.9	127.8	191.8	255.7	319.6	383.5	447.4	511.3	575.3	639.2
30%	0.0	95.9	191.8	287.6	383.5	479.4	575.3	671.1	767.0	862.9	958.8
40%	0.0	127.8	255.7	383.5	511.3	639.2	767.0	894.9	1022.7	1150.5	1278.4
50%	0.0	159.8	319.6	479.4	639.2	799.0	958.8	1118.6	1278.4	1438.2	1598.0
60%	0.0	191.8	383.5	575.3	767.0	958.8	1150.5	1342.3	1534.0	1725.8	1917.6
70%	0.0	223.7	447.4	671.1	894.9	1118.6	1342.3	1566.0	1789.7	2013.4	2237.1
80%	0.0	255.7	511.3	767.0	1022.7	1278.4	1534.0	1789.7	2045.4	2301.1	2556.7
90%	0.0	287.6	575.3	862.9	1150.5	1438.2	1725.8	2013.4	2301.1	2588.7	2876.3
100%	0.0	319.6	639.2	958.8	1278.4	1598.0	1917.6	2237.1	2556.7	2876.3	3195.9

Table 3-18. Potential guillemot mortality following displacement from OAA plus 2 km buffer in the non-breeding season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	2.2	4.4	6.6	8.8	11.0	13.2	15.4	17.6	19.8	22.0
1%	0.0	4.4	8.8	13.2	17.6	22.0	26.4	30.8	35.1	39.5	43.9
2%	0.0	8.8	17.6	26.4	35.1	43.9	52.7	61.5	70.3	79.1	87.9
3%	0.0	13.2	26.4	39.5	52.7	65.9	79.1	92.3	105.4	118.6	131.8
4%	0.0	17.6	35.1	52.7	70.3	87.9	105.4	123.0	140.6	158.1	175.7
5%	0.0	22.0	43.9	65.9	87.9	109.8	131.8	153.8	175.7	197.7	219.6
10%	0.0	43.9	87.9	131.8	175.7	219.6	263.6	307.5	351.4	395.4	439.3
15%	0.0	65.9	131.8	197.7	263.6	329.5	395.4	461.3	527.2	593.0	658.9
20%	0.0	87.9	175.7	263.6	351.4	439.3	527.2	615.0	702.9	790.7	878.6
30%	0.0	131.8	263.6	395.4	527.2	658.9	790.7	922.5	1054.3	1186.1	1317.9
40%	0.0	175.7	351.4	527.2	702.9	878.6	1054.3	1230.0	1405.7	1581.5	1757.2
50%	0.0	219.6	439.3	658.9	878.6	1098.2	1317.9	1537.5	1757.2	1976.8	2196.5
60%	0.0	263.6	527.2	790.7	1054.3	1317.9	1581.5	1845.0	2108.6	2372.2	2635.8
70%	0.0	307.5	615.0	922.5	1230.0	1537.5	1845.0	2152.5	2460.0	2767.5	3075.0
80%	0.0	351.4	702.9	1054.3	1405.7	1757.2	2108.6	2460.0	2811.5	3162.9	3514.3
90%	0.0	395.4	790.7	1186.1	1581.5	1976.8	2372.2	2767.5	3162.9	3558.3	3953.6
100%	0.0	439.3	878.6	1317.9	1757.2	2196.5	2635.8	3075.0	3514.3	3953.6	4392.9

3.1.4 Razorbill

50. Razorbill seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-19** to **Table** 3-28. The highest displacement impact ('high' impact scenario of 60% displacement and 5% mortality) predicted a displacement mortality of 4.2 razorbills in the OAA plus 2 km buffer during the breeding season. During the non-breeding season and the BDMPS spring migration, the highest impact ('high' impact of 60% displacement and 3% mortality) predicted a displacement mortality of 2.4 birds in the OAA plus 2 km buffer; during the autumn migration a mortality of 2 birds was predicted. The smallest displacement mortality of 0.3 razorbills was predicted in the winter.

3.1.4.1 Razorbill – Breeding season

Table 3-19. Potential razorbill mortality following displacement from the OAA in the breeding season.

Low = 60% displacement and 3% mortality. High = 60% displacement and 5% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.8	0.9	1.0	1.1
2%	0.0	0.2	0.4	0.7	0.9	1.1	1.3	1.5	1.8	2.0	2.2
3%	0.0	0.3	0.7	1.0	1.3	1.6	2.0	2.3	2.6	3.0	3.3
4%	0.0	0.4	0.9	1.3	1.8	2.2	2.6	3.1	3.5	3.9	4.4
5%	0.0	0.5	1.1	1.6	2.2	2.7	3.3	3.8	4.4	4.9	5.5
10%	0.0	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0
15%	0.0	1.6	3.3	4.9	6.6	8.2	9.9	11.5	13.1	14.8	16.4
20%	0.0	2.2	4.4	6.6	8.8	11.0	13.1	15.3	17.5	19.7	21.9
30%	0.0	3.3	6.6	9.9	13.1	16.4	19.7	23.0	26.3	29.6	32.9
40%	0.0	4.4	8.8	13.1	17.5	21.9	26.3	30.7	35.1	39.4	43.8
50%	0.0	5.5	11.0	16.4	21.9	27.4	32.9	38.3	43.8	49.3	54.8
60%	0.0	6.6	13.1	19.7	26.3	32.9	39.4	46.0	52.6	59.2	65.7
70%	0.0	7.7	15.3	23.0	30.7	38.3	46.0	53.7	61.3	69.0	76.7
80%	0.0	8.8	17.5	26.3	35.1	43.8	52.6	61.3	70.1	78.9	87.6
90%	0.0	9.9	19.7	29.6	39.4	49.3	59.2	69.0	78.9	88.7	98.6
100%	0.0	11.0	21.9	32.9	43.8	54.8	65.7	76.7	87.6	98.6	109.5

Table 3-20. Potential razorbill mortality following displacement from the OAA plus 2 km buffer in the breeding season.

Low = 60% displacement and 3% mortality. High = 60% displacement and 5% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7
1%	0.0	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.4
2%	0.0	0.3	0.6	0.8	1.1	1.4	1.7	2.0	2.3	2.5	2.8
3%	0.0	0.4	0.8	1.3	1.7	2.1	2.5	3.0	3.4	3.8	4.2
4%	0.0	0.6	1.1	1.7	2.3	2.8	3.4	4.0	4.5	5.1	5.6
5%	0.0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.4	7.1
10%	0.0	1.4	2.8	4.2	5.6	7.1	8.5	9.9	11.3	12.7	14.1
15%	0.0	2.1	4.2	6.4	8.5	10.6	12.7	14.8	16.9	19.1	21.2
20%	0.0	2.8	5.6	8.5	11.3	14.1	16.9	19.8	22.6	25.4	28.2
30%	0.0	4.2	8.5	12.7	16.9	21.2	25.4	29.6	33.9	38.1	42.4
40%	0.0	5.6	11.3	16.9	22.6	28.2	33.9	39.5	45.2	50.8	56.5
50%	0.0	7.1	14.1	21.2	28.2	35.3	42.4	49.4	56.5	63.5	70.6
60%	0.0	8.5	16.9	25.4	33.9	42.4	50.8	59.3	67.8	76.2	84.7

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
70%	0.0	9.9	19.8	29.6	39.5	49.4	59.3	69.2	79.1	88.9	98.8
80%	0.0	11.3	22.6	33.9	45.2	56.5	67.8	79.1	90.4	101.7	112.9
90%	0.0	12.7	25.4	38.1	50.8	63.5	76.2	88.9	101.7	114.4	127.1
100%	0.0	14.1	28.2	42.4	56.5	70.6	84.7	98.8	112.9	127.1	141.2

3.1.4.2 Razorbill – Non-breeding season

Table 3-21. Potential razorbill mortality following displacement from the OAA in the non-breeding season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
2%	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
3%	0.0	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0
4%	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
5%	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
10%	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.1	9.1	10.1
15%	0.0	1.5	3.0	4.5	6.0	7.6	9.1	10.6	12.1	13.6	15.1
20%	0.0	2.0	4.0	6.0	8.1	10.1	12.1	14.1	16.1	18.1	20.1
30%	0.0	3.0	6.0	9.1	12.1	15.1	18.1	21.1	24.2	27.2	30.2
40%	0.0	4.0	8.1	12.1	16.1	20.1	24.2	28.2	32.2	36.2	40.3
50%	0.0	5.0	10.1	15.1	20.1	25.2	30.2	35.2	40.3	45.3	50.3
60%	0.0	6.0	12.1	18.1	24.2	30.2	36.2	42.3	48.3	54.4	60.4
70%	0.0	7.0	14.1	21.1	28.2	35.2	42.3	49.3	56.4	63.4	70.5
80%	0.0	8.1	16.1	24.2	32.2	40.3	48.3	56.4	64.4	72.5	80.5
90%	0.0	9.1	18.1	27.2	36.2	45.3	54.4	63.4	72.5	81.6	90.6
100%	0.0	10.1	20.1	30.2	40.3	50.3	60.4	70.5	80.5	90.6	100.7

Table 3-22. Potential razorbill mortality following displacement from OAA plus 2 km buffer in the non-breeding season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0.5%	0.0	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7
1%	0.0	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.1	1.2	1.3
2%	0.0	0.3	0.5	0.8	1.1	1.3	1.6	1.8	2.1	2.4	2.6
3%	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
4%	0.0	0.5	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.7	5.3
5%	0.0	0.7	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6
10%	0.0	1.3	2.6	4.0	5.3	6.6	7.9	9.2	10.5	11.9	13.2
15%	0.0	2.0	4.0	5.9	7.9	9.9	11.9	13.8	15.8	17.8	19.8
20%	0.0	2.6	5.3	7.9	10.5	13.2	15.8	18.5	21.1	23.7	26.4
30%	0.0	4.0	7.9	11.9	15.8	19.8	23.7	27.7	31.6	35.6	39.5
40%	0.0	5.3	10.5	15.8	21.1	26.4	31.6	36.9	42.2	47.4	52.7
50%	0.0	6.6	13.2	19.8	26.4	32.9	39.5	46.1	52.7	59.3	65.9
60%	0.0	7.9	15.8	23.7	31.6	39.5	47.4	55.4	63.3	71.2	79.1
70%	0.0	9.2	18.5	27.7	36.9	46.1	55.4	64.6	73.8	83.0	92.3
80%	0.0	10.5	21.1	31.6	42.2	52.7	63.3	73.8	84.3	94.9	105.4
90%	0.0	11.9	23.7	35.6	47.4	59.3	71.2	83.0	94.9	106.7	118.6

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
100%	0.0	13.2	26.4	39.5	52.7	65.9	79.1	92.3	105.4	118.6	131.8

3.1.4.3 Razorbill – Spring migration

Table 3-23. Potential razorbill mortality following displacement from the OAA in the spring migration season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.8
2%	0.0	0.2	0.3	0.5	0.7	0.8	1.0	1.1	1.3	1.5	1.6
3%	0.0	0.2	0.5	0.7	1.0	1.2	1.5	1.7	2.0	2.2	2.4
4%	0.0	0.3	0.7	1.0	1.3	1.6	2.0	2.3	2.6	2.9	3.3
5%	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.3	3.7	4.1
10%	0.0	0.8	1.6	2.4	3.3	4.1	4.9	5.7	6.5	7.3	8.1
15%	0.0	1.2	2.4	3.7	4.9	6.1	7.3	8.5	9.8	11.0	12.2
20%	0.0	1.6	3.3	4.9	6.5	8.1	9.8	11.4	13.0	14.6	16.3
30%	0.0	2.4	4.9	7.3	9.8	12.2	14.6	17.1	19.5	22.0	24.4
40%	0.0	3.3	6.5	9.8	13.0	16.3	19.5	22.8	26.0	29.3	32.6
50%	0.0	4.1	8.1	12.2	16.3	20.3	24.4	28.5	32.6	36.6	40.7
60%	0.0	4.9	9.8	14.6	19.5	24.4	29.3	34.2	39.1	43.9	48.8
70%	0.0	5.7	11.4	17.1	22.8	28.5	34.2	39.9	45.6	51.3	57.0
80%	0.0	6.5	13.0	19.5	26.0	32.6	39.1	45.6	52.1	58.6	65.1
90%	0.0	7.3	14.6	22.0	29.3	36.6	43.9	51.3	58.6	65.9	73.2
100%	0.0	8.1	16.3	24.4	32.6	40.7	48.8	57.0	65.1	73.2	81.4

Table 3-24. Potential razorbill mortality following displacement from the OAA plus 2 km buffer in the spring migration season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.1	1.2	1.3
2%	0.0	0.3	0.5	0.8	1.1	1.3	1.6	1.8	2.1	2.4	2.6
3%	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
4%	0.0	0.5	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.7	5.3
5%	0.0	0.7	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6
10%	0.0	1.3	2.6	4.0	5.3	6.6	7.9	9.2	10.5	11.9	13.2
15%	0.0	2.0	4.0	5.9	7.9	9.9	11.9	13.8	15.8	17.8	19.8
20%	0.0	2.6	5.3	7.9	10.5	13.2	15.8	18.4	21.1	23.7	26.4
30%	0.0	4.0	7.9	11.9	15.8	19.8	23.7	27.7	31.6	35.6	39.5
40%	0.0	5.3	10.5	15.8	21.1	26.4	31.6	36.9	42.2	47.4	52.7
50%	0.0	6.6	13.2	19.8	26.4	32.9	39.5	46.1	52.7	59.3	65.9
60%	0.0	7.9	15.8	23.7	31.6	39.5	47.4	55.3	63.3	71.2	79.1
70%	0.0	9.2	18.4	27.7	36.9	46.1	55.3	64.6	73.8	83.0	92.2
80%	0.0	10.5	21.1	31.6	42.2	52.7	63.3	73.8	84.3	94.9	105.4
90%	0.0	11.9	23.7	35.6	47.4	59.3	71.2	83.0	94.9	106.7	118.6
100%	0.0	13.2	26.4	39.5	52.7	65.9	79.1	92.2	105.4	118.6	131.8

3.1.4.4 *Razorbill – Autumn migration*

Table 3-25. Potential razorbill mortality following displacement from the OAA in the autumn migration season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
2%	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
3%	0.0	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0
4%	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
5%	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
10%	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.1	9.1	10.1
15%	0.0	1.5	3.0	4.5	6.0	7.6	9.1	10.6	12.1	13.6	15.1
20%	0.0	2.0	4.0	6.0	8.1	10.1	12.1	14.1	16.1	18.1	20.1
30%	0.0	3.0	6.0	9.1	12.1	15.1	18.1	21.1	24.2	27.2	30.2
40%	0.0	4.0	8.1	12.1	16.1	20.1	24.2	28.2	32.2	36.2	40.3
50%	0.0	5.0	10.1	15.1	20.1	25.2	30.2	35.2	40.3	45.3	50.3
60%	0.0	6.0	12.1	18.1	24.2	30.2	36.2	42.3	48.3	54.4	60.4
70%	0.0	7.0	14.1	21.1	28.2	35.2	42.3	49.3	56.4	63.4	70.5
80%	0.0	8.1	16.1	24.2	32.2	40.3	48.3	56.4	64.4	72.5	80.5
90%	0.0	9.1	18.1	27.2	36.2	45.3	54.4	63.4	72.5	81.6	90.6
100%	0.0	10.1	20.1	30.2	40.3	50.3	60.4	70.5	80.5	90.6	100.7

Table 3-26. Potential razorbill mortality following displacement from the OAA plus 2 km buffer in the autumn migration season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.8	0.9	1.0	1.1
2%	0.0	0.2	0.4	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2
3%	0.0	0.3	0.7	1.0	1.3	1.7	2.0	2.4	2.7	3.0	3.4
4%	0.0	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.6	4.0	4.5
5%	0.0	0.6	1.1	1.7	2.2	2.8	3.4	3.9	4.5	5.1	5.6
10%	0.0	1.1	2.2	3.4	4.5	5.6	6.7	7.9	9.0	10.1	11.2
15%	0.0	1.7	3.4	5.1	6.7	8.4	10.1	11.8	13.5	15.2	16.8
20%	0.0	2.2	4.5	6.7	9.0	11.2	13.5	15.7	18.0	20.2	22.5
30%	0.0	3.4	6.7	10.1	13.5	16.8	20.2	23.6	27.0	30.3	33.7
40%	0.0	4.5	9.0	13.5	18.0	22.5	27.0	31.4	35.9	40.4	44.9
50%	0.0	5.6	11.2	16.8	22.5	28.1	33.7	39.3	44.9	50.5	56.2
60%	0.0	6.7	13.5	20.2	27.0	33.7	40.4	47.2	53.9	60.6	67.4
70%	0.0	7.9	15.7	23.6	31.4	39.3	47.2	55.0	62.9	70.8	78.6
80%	0.0	9.0	18.0	27.0	35.9	44.9	53.9	62.9	71.9	80.9	89.8
90%	0.0	10.1	20.2	30.3	40.4	50.5	60.6	70.8	80.9	91.0	101.1
100%	0.0	11.2	22.5	33.7	44.9	56.2	67.4	78.6	89.8	101.1	112.3

3.1.4.5 *Razorbill – Winter*

Table 3-27. Potential razorbill mortality following displacement from OAA in the winter period.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
2%	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2
3%	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
4%	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3
5%	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4
10%	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8
15%	0.0	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.2
20%	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5
30%	0.0	0.2	0.5	0.7	0.9	1.2	1.4	1.6	1.9	2.1	2.3
40%	0.0	0.3	0.6	0.9	1.2	1.5	1.9	2.2	2.5	2.8	3.1
50%	0.0	0.4	0.8	1.2	1.5	1.9	2.3	2.7	3.1	3.5	3.9
60%	0.0	0.5	0.9	1.4	1.9	2.3	2.8	3.3	3.7	4.2	4.6
70%	0.0	0.5	1.1	1.6	2.2	2.7	3.3	3.8	4.3	4.9	5.4
80%	0.0	0.6	1.2	1.9	2.5	3.1	3.7	4.3	5.0	5.6	6.2
90%	0.0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0
100%	0.0	0.8	1.5	2.3	3.1	3.9	4.6	5.4	6.2	7.0	7.7

Table 3-28. Potential razorbill mortality following displacement from OAA plus 2 km buffer in the winter period.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
2%	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4
3%	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6
4%	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8
5%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
10%	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.7	1.9
15%	0.0	0.3	0.6	0.9	1.2	1.5	1.7	2.0	2.3	2.6	2.9
20%	0.0	0.4	0.8	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.9
30%	0.0	0.6	1.2	1.7	2.3	2.9	3.5	4.1	4.7	5.2	5.8
40%	0.0	0.8	1.6	2.3	3.1	3.9	4.7	5.4	6.2	7.0	7.8
50%	0.0	1.0	1.9	2.9	3.9	4.8	5.8	6.8	7.8	8.7	9.7
60%	0.0	1.2	2.3	3.5	4.7	5.8	7.0	8.1	9.3	10.5	11.6
70%	0.0	1.4	2.7	4.1	5.4	6.8	8.1	9.5	10.9	12.2	13.6
80%	0.0	1.6	3.1	4.7	6.2	7.8	9.3	10.9	12.4	14.0	15.5
90%	0.0	1.7	3.5	5.2	7.0	8.7	10.5	12.2	14.0	15.7	17.4
100%	0.0	1.9	3.9	5.8	7.8	9.7	11.6	13.6	15.5	17.4	19.4

3.1.5 Puffin

51. Puffin seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-29** to **Table 3-32**. The highest displacement impact ('high' impact scenario of 60% displacement and 5% mortality) predicted a displacement mortality of 158 puffins in the OAA plus 2km buffer during the breeding season. During the non-breeding season, the highest displacement ('high' impact of 60% displacement and 3% mortality) impact predicted a displacement mortality of 38 birds in the OAA plus 2 km buffer.

3.1.5.1 Puffin – Breeding season

Table 3-29. Potential puffin mortality following displacement from the OAA in the breeding season.

Low = 60% displacement and 3% mortality. High = 60% displacement and 5% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	4.2	8.4	12.6	16.8	21.1	25.3	29.5	33.7	37.9	42.1
2%	0.0	8.4	16.8	25.3	33.7	42.1	50.5	58.9	67.4	75.8	84.2
3%	0.0	12.6	25.3	37.9	50.5	63.2	75.8	88.4	101.1	113.7	126.3
4%	0.0	16.8	33.7	50.5	67.4	84.2	101.1	117.9	134.7	151.6	168.4
5%	0.0	21.1	42.1	63.2	84.2	105.3	126.3	147.4	168.4	189.5	210.5
10%	0.0	42.1	84.2	126.3	168.4	210.5	252.6	294.7	336.8	378.9	421.1
15%	0.0	63.2	126.3	189.5	252.6	315.8	378.9	442.1	505.3	568.4	631.6
20%	0.0	84.2	168.4	252.6	336.8	421.1	505.3	589.5	673.7	757.9	842.1
30%	0.0	126.3	252.6	378.9	505.3	631.6	757.9	884.2	1010.5	1136.8	1263.2
40%	0.0	168.4	336.8	505.3	673.7	842.1	1010.5	1179.0	1347.4	1515.8	1684.2
50%	0.0	210.5	421.1	631.6	842.1	1052.6	1263.2	1473.7	1684.2	1894.7	2105.3
60%	0.0	252.6	505.3	757.9	1010.5	1263.2	1515.8	1768.4	2021.1	2273.7	2526.3
70%	0.0	294.7	589.5	884.2	1179.0	1473.7	1768.4	2063.2	2357.9	2652.6	2947.4
80%	0.0	336.8	673.7	1010.5	1347.4	1684.2	2021.1	2357.9	2694.7	3031.6	3368.4
90%	0.0	378.9	757.9	1136.8	1515.8	1894.7	2273.7	2652.6	3031.6	3410.5	3789.5
100%	0.0	421.1	842.1	1263.2	1684.2	2105.3	2526.3	2947.4	3368.4	3789.5	4210.5

Table 3-30. Potential puffin mortality following displacement from the OAA plus 2 km buffer in the breeding season.

Low = 60% displacement and 3% mortality. High = 60% displacement and 5% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	5.3	10.5	15.8	21.1	26.4	31.6	36.9	42.2	47.4	52.7
2%	0.0	10.5	21.1	31.6	42.2	52.7	63.3	73.8	84.3	94.9	105.4
3%	0.0	15.8	31.6	47.4	63.3	79.1	94.9	110.7	126.5	142.3	158.2
4%	0.0	21.1	42.2	63.3	84.3	105.4	126.5	147.6	168.7	189.8	210.9
5%	0.0	26.4	52.7	79.1	105.4	131.8	158.2	184.5	210.9	237.2	263.6
10%	0.0	52.7	105.4	158.2	210.9	263.6	316.3	369.0	421.7	474.5	527.2
15%	0.0	79.1	158.2	237.2	316.3	395.4	474.5	553.5	632.6	711.7	790.8
20%	0.0	105.4	210.9	316.3	421.7	527.2	632.6	738.1	843.5	948.9	1054.4
30%	0.0	158.2	316.3	474.5	632.6	790.8	948.9	1107.1	1265.2	1423.4	1581.6
40%	0.0	210.9	421.7	632.6	843.5	1054.4	1265.2	1476.1	1687.0	1897.9	2108.7
50%	0.0	263.6	527.2	790.8	1054.4	1318.0	1581.6	1845.2	2108.7	2372.3	2635.9
60%	0.0	316.3	632.6	948.9	1265.2	1581.6	1897.9	2214.2	2530.5	2846.8	3163.1

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
70%	0.0	369.0	738.1	1107.1	1476.1	1845.2	2214.2	2583.2	2952.2	3321.3	3690.3
80%	0.0	421.7	843.5	1265.2	1687.0	2108.7	2530.5	2952.2	3374.0	3795.7	4217.5
90%	0.0	474.5	948.9	1423.4	1897.9	2372.3	2846.8	3321.3	3795.7	4270.2	4744.7
100%	0.0	527.2	1054.4	1581.6	2108.7	2635.9	3163.1	3690.3	4217.5	4744.7	5271.9

3.1.5.2 *Puffin – Non-breeding season*

Table 3-31. Potential puffin mortality following displacement from the OAA in the non-breeding season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	1.5	3.0	4.6	6.1	7.6	9.1	10.7	12.2	13.7	15.2
2%	0.0	3.0	6.1	9.1	12.2	15.2	18.3	21.3	24.4	27.4	30.5
3%	0.0	4.6	9.1	13.7	18.3	22.8	27.4	32.0	36.5	41.1	45.7
4%	0.0	6.1	12.2	18.3	24.4	30.5	36.5	42.6	48.7	54.8	60.9
5%	0.0	7.6	15.2	22.8	30.5	38.1	45.7	53.3	60.9	68.5	76.1
10%	0.0	15.2	30.5	45.7	60.9	76.1	91.4	106.6	121.8	137.1	152.3
15%	0.0	22.8	45.7	68.5	91.4	114.2	137.1	159.9	182.7	205.6	228.4
20%	0.0	30.5	60.9	91.4	121.8	152.3	182.7	213.2	243.7	274.1	304.6
30%	0.0	45.7	91.4	137.1	182.7	228.4	274.1	319.8	365.5	411.2	456.9
40%	0.0	60.9	121.8	182.7	243.7	304.6	365.5	426.4	487.3	548.2	609.1
50%	0.0	76.1	152.3	228.4	304.6	380.7	456.9	533.0	609.1	685.3	761.4
60%	0.0	91.4	182.7	274.1	365.5	456.9	548.2	639.6	731.0	822.3	913.7
70%	0.0	106.6	213.2	319.8	426.4	533.0	639.6	746.2	852.8	959.4	1066.0
80%	0.0	121.8	243.7	365.5	487.3	609.1	731.0	852.8	974.6	1096.4	1218.3
90%	0.0	137.1	274.1	411.2	548.2	685.3	822.3	959.4	1096.4	1233.5	1370.6
100%	0.0	152.3	304.6	456.9	609.1	761.4	913.7	1066.0	1218.3	1370.6	1522.8

Table 3-32. Potential puffin mortality following displacement from the OAA plus 2 km buffer in the non-breeding season.

Low = 60% displacement and 1% mortality. High = 60% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	2.1	4.3	6.4	8.5	10.7	12.8	15.0	17.1	19.2	21.4
2%	0.0	4.3	8.5	12.8	17.1	21.4	25.6	29.9	34.2	38.4	42.7
3%	0.0	6.4	12.8	19.2	25.6	32.0	38.4	44.9	51.3	57.7	64.1
4%	0.0	8.5	17.1	25.6	34.2	42.7	51.3	59.8	68.4	76.9	85.4
5%	0.0	10.7	21.4	32.0	42.7	53.4	64.1	74.8	85.4	96.1	106.8
10%	0.0	21.4	42.7	64.1	85.4	106.8	128.2	149.5	170.9	192.2	213.6
15%	0.0	32.0	64.1	96.1	128.2	160.2	192.2	224.3	256.3	288.4	320.4
20%	0.0	42.7	85.4	128.2	170.9	213.6	256.3	299.0	341.8	384.5	427.2
30%	0.0	64.1	128.2	192.2	256.3	320.4	384.5	448.5	512.6	576.7	640.8
40%	0.0	85.4	170.9	256.3	341.8	427.2	512.6	598.1	683.5	768.9	854.4
50%	0.0	106.8	213.6	320.4	427.2	534.0	640.8	747.6	854.4	961.2	1068.0
60%	0.0	128.2	256.3	384.5	512.6	640.8	768.9	897.1	1025.3	1153.4	1281.6
70%	0.0	149.5	299.0	448.5	598.1	747.6	897.1	1046.6	1196.1	1345.6	1495.2
80%	0.0	170.9	341.8	512.6	683.5	854.4	1025.3	1196.1	1367.0	1537.9	1708.8

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
90%	0.0	192.2	384.5	576.7	768.9	961.2	1153.4	1345.6	1537.9	1730.1	1922.4
100%	0.0	213.6	427.2	640.8	854.4	1068.0	1281.6	1495.2	1708.8	1922.4	2135.9

3.1.6 Fulmar

52. Fulmar seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-33** to **Table 3-42**.The highest displacement impact ('high' impact scenario of 20% displacement and 3% mortality) predicted a displacement mortality of 17 fulmars in the OAA plus 2 km buffer during the non-breeding season as well as the BDMPS spring migration; in the BDMPS autumn migration period, the predicted displacement mortality was 14.6 birds in the same area. During the breeding season, the highest impact predicted a displacement mortality of nine birds in the OAA plus 2 km buffer. The smallest displacement mortality of 4.9 fulmars was predicted in the BDMPS winter period.

3.1.6.1 Fulmar – Breeding season

Table 3-33. Potential fulmar mortality following displacement from the OAA in the breeding season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

		DISPLACEMENT										
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	1.2	2.3	3.5	4.7	5.8	7.0	8.1	9.3	10.5	11.6
	2%	0.0	2.3	4.7	7.0	9.3	11.6	14.0	16.3	18.6	20.9	23.3
	3%	0.0	3.5	7.0	10.5	14.0	17.5	20.9	24.4	27.9	31.4	34.9
	4%	0.0	4.7	9.3	14.0	18.6	23.3	27.9	32.6	37.2	41.9	46.6
	5%	0.0	5.8	11.6	17.5	23.3	29.1	34.9	40.7	46.6	52.4	58.2
	10%	0.0	11.6	23.3	34.9	46.6	58.2	69.8	81.5	93.1	104.7	116.4
	15%	0.0	17.5	34.9	52.4	69.8	87.3	104.7	122.2	139.7	157.1	174.6
	20%	0.0	23.3	46.6	69.8	93.1	116.4	139.7	162.9	186.2	209.5	232.8
	30%	0.0	34.9	69.8	104.7	139.7	174.6	209.5	244.4	279.3	314.2	349.2
	40%	0.0	46.6	93.1	139.7	186.2	232.8	279.3	325.9	372.4	419.0	465.5
	50%	0.0	58.2	116.4	174.6	232.8	291.0	349.2	407.4	465.5	523.7	581.9
	60%	0.0	69.8	139.7	209.5	279.3	349.2	419.0	488.8	558.7	628.5	698.3
	70%	0.0	81.5	162.9	244.4	325.9	407.4	488.8	570.3	651.8	733.2	814.7
	80%	0.0	93.1	186.2	279.3	372.4	465.5	558.7	651.8	744.9	838.0	931.1
	90%	0.0	104.7	209.5	314.2	419.0	523.7	628.5	733.2	838.0	942.7	1047.5
	100%	0.0	116.4	232.8	349.2	465.5	581.9	698.3	814.7	931.1	1047.5	1163.9

Table 3-34. Potential fulmar mortality following displacement from OAA plus 2 km buffer in the breeding season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

		DISPLACEMENT										
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	1.5	3.1	4.6	6.1	7.7	9.2	10.8	12.3	13.8	15.4
	2%	0.0	3.1	6.1	9.2	12.3	15.4	18.4	21.5	24.6	27.7	30.7
	3%	0.0	4.6	9.2	13.8	18.4	23.0	27.7	32.3	36.9	41.5	46.1
	4%	0.0	6.1	12.3	18.4	24.6	30.7	36.9	43.0	49.2	55.3	61.4
	5%	0.0	7.7	15.4	23.0	30.7	38.4	46.1	53.8	61.4	69.1	76.8

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
10%	0.0	15.4	30.7	46.1	61.4	76.8	92.2	107.5	122.9	138.3	153.6
15%	0.0	23.0	46.1	69.1	92.2	115.2	138.3	161.3	184.3	207.4	230.4
20%	0.0	30.7	61.4	92.2	122.9	153.6	184.3	215.1	245.8	276.5	307.2
30%	0.0	46.1	92.2	138.3	184.3	230.4	276.5	322.6	368.7	414.8	460.8
40%	0.0	61.4	122.9	184.3	245.8	307.2	368.7	430.1	491.6	553.0	614.4
50%	0.0	76.8	153.6	230.4	307.2	384.0	460.8	537.6	614.4	691.3	768.1
60%	0.0	92.2	184.3	276.5	368.7	460.8	553.0	645.2	737.3	829.5	921.7
70%	0.0	107.5	215.1	322.6	430.1	537.6	645.2	752.7	860.2	967.8	1075.3
80%	0.0	122.9	245.8	368.7	491.6	614.4	737.3	860.2	983.1	1106.0	1228.9
90%	0.0	138.3	276.5	414.8	553.0	691.3	829.5	967.8	1106.0	1244.3	1382.5
100%	0.0	153.6	307.2	460.8	614.4	768.1	921.7	1075.3	1228.9	1382.5	1536.1

3.1.6.2 Fulmar – Non-breeding season

Table 3-35. Potential fulmar mortality following displacement from OAA in the non-breeding season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	2.2	4.5	6.7	8.9	11.2	13.4	15.6	17.9	20.1	22.3
2%	0.0	4.5	8.9	13.4	17.9	22.3	26.8	31.2	35.7	40.2	44.6
3%	0.0	6.7	13.4	20.1	26.8	33.5	40.2	46.9	53.6	60.2	66.9
4%	0.0	8.9	17.9	26.8	35.7	44.6	53.6	62.5	71.4	80.3	89.3
5%	0.0	11.2	22.3	33.5	44.6	55.8	66.9	78.1	89.3	100.4	111.6
10%	0.0	22.3	44.6	66.9	89.3	111.6	133.9	156.2	178.5	200.8	223.1
15%	0.0	33.5	66.9	100.4	133.9	167.4	200.8	234.3	267.8	301.2	334.7
20%	0.0	44.6	89.3	133.9	178.5	223.1	267.8	312.4	357.0	401.7	446.3
30%	0.0	66.9	133.9	200.8	267.8	334.7	401.7	468.6	535.6	602.5	669.4
40%	0.0	89.3	178.5	267.8	357.0	446.3	535.6	624.8	714.1	803.3	892.6
50%	0.0	111.6	223.1	334.7	446.3	557.9	669.4	781.0	892.6	1004.2	1115.7
60%	0.0	133.9	267.8	401.7	535.6	669.4	803.3	937.2	1071.1	1205.0	1338.9
70%	0.0	156.2	312.4	468.6	624.8	781.0	937.2	1093.4	1249.6	1405.8	1562.0
80%	0.0	178.5	357.0	535.6	714.1	892.6	1071.1	1249.6	1428.1	1606.7	1785.2
90%	0.0	200.8	401.7	602.5	803.3	1004.2	1205.0	1405.8	1606.7	1807.5	2008.3
100%	0.0	223.1	446.3	669.4	892.6	1115.7	1338.9	1562.0	1785.2	2008.3	2231.5

Table 3-36. Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the non-breeding season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	2.9	5.7	8.6	11.5	14.3	17.2	20.0	22.9	25.8	28.6
2%	0.0	5.7	11.5	17.2	22.9	28.6	34.4	40.1	45.8	51.6	57.3
3%	0.0	8.6	17.2	25.8	34.4	43.0	51.6	60.1	68.7	77.3	85.9
4%	0.0	11.5	22.9	34.4	45.8	57.3	68.7	80.2	91.7	103.1	114.6
5%	0.0	14.3	28.6	43.0	57.3	71.6	85.9	100.2	114.6	128.9	143.2
10%	0.0	28.6	57.3	85.9	114.6	143.2	171.8	200.5	229.1	257.8	286.4
15%	0.0	43.0	85.9	128.9	171.8	214.8	257.8	300.7	343.7	386.7	429.6
20%	0.0	57.3	114.6	171.8	229.1	286.4	343.7	401.0	458.3	515.5	572.8
30%	0.0	85.9	171.8	257.8	343.7	429.6	515.5	601.5	687.4	773.3	859.2

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
40%	0.0	114.6	229.1	343.7	458.3	572.8	687.4	802.0	916.5	1031.1	1145.7
50%	0.0	143.2	286.4	429.6	572.8	716.0	859.2	1002.4	1145.7	1288.9	1432.1
60%	0.0	171.8	343.7	515.5	687.4	859.2	1031.1	1202.9	1374.8	1546.6	1718.5
70%	0.0	200.5	401.0	601.5	802.0	1002.4	1202.9	1403.4	1603.9	1804.4	2004.9
80%	0.0	229.1	458.3	687.4	916.5	1145.7	1374.8	1603.9	1833.0	2062.2	2291.3
90%	0.0	257.8	515.5	773.3	1031.1	1288.9	1546.6	1804.4	2062.2	2320.0	2577.7
100%	0.0	286.4	572.8	859.2	1145.7	1432.1	1718.5	2004.9	2291.3	2577.7	2864.1

3.1.6.3 Fulmar – Spring migration

Table 3-37. Potential fulmar mortality following displacement from the OAA in the spring migration season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

		DISPLACEMENT										
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	1.6	3.3	4.9	6.5	8.2	9.8	11.4	13.1	14.7	16.4
	2%	0.0	3.3	6.5	9.8	13.1	16.4	19.6	22.9	26.2	29.4	32.7
	3%	0.0	4.9	9.8	14.7	19.6	24.5	29.4	34.3	39.2	44.1	49.1
	4%	0.0	6.5	13.1	19.6	26.2	32.7	39.2	45.8	52.3	58.9	65.4
	5%	0.0	8.2	16.4	24.5	32.7	40.9	49.1	57.2	65.4	73.6	81.8
	10%	0.0	16.4	32.7	49.1	65.4	81.8	98.1	114.5	130.8	147.2	163.5
	15%	0.0	24.5	49.1	73.6	98.1	122.6	147.2	171.7	196.2	220.7	245.3
	20%	0.0	32.7	65.4	98.1	130.8	163.5	196.2	228.9	261.6	294.3	327.0
	30%	0.0	49.1	98.1	147.2	196.2	245.3	294.3	343.4	392.4	441.5	490.5
	40%	0.0	65.4	130.8	196.2	261.6	327.0	392.4	457.8	523.2	588.6	654.0
	50%	0.0	81.8	163.5	245.3	327.0	408.8	490.5	572.3	654.0	735.8	817.6
	60%	0.0	98.1	196.2	294.3	392.4	490.5	588.6	686.8	784.9	883.0	981.1
	70%	0.0	114.5	228.9	343.4	457.8	572.3	686.8	801.2	915.7	1030.1	1144.6
	80%	0.0	130.8	261.6	392.4	523.2	654.0	784.9	915.7	1046.5	1177.3	1308.1
	90%	0.0	147.2	294.3	441.5	588.6	735.8	883.0	1030.1	1177.3	1324.4	1471.6
	100%	0.0	163.5	327.0	490.5	654.0	817.6	981.1	1144.6	1308.1	1471.6	1635.1

Table 3-38. Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the spring migration season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

		DISPLACEMENT										
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	2.9	5.7	8.6	11.5	14.3	17.2	20.0	22.9	25.8	28.6
	2%	0.0	5.7	11.5	17.2	22.9	28.6	34.4	40.1	45.8	51.6	57.3
	3%	0.0	8.6	17.2	25.8	34.4	43.0	51.6	60.1	68.7	77.3	85.9
	4%	0.0	11.5	22.9	34.4	45.8	57.3	68.7	80.2	91.7	103.1	114.6
	5%	0.0	14.3	28.6	43.0	57.3	71.6	85.9	100.2	114.6	128.9	143.2
	10%	0.0	28.6	57.3	85.9	114.6	143.2	171.8	200.5	229.1	257.8	286.4
	15%	0.0	43.0	85.9	128.9	171.8	214.8	257.8	300.7	343.7	386.7	429.6
	20%	0.0	57.3	114.6	171.8	229.1	286.4	343.7	401.0	458.3	515.5	572.8
	30%	0.0	85.9	171.8	257.8	343.7	429.6	515.5	601.5	687.4	773.3	859.2
	40%	0.0	114.6	229.1	343.7	458.3	572.8	687.4	802.0	916.5	1031.1	1145.7
	50%	0.0	143.2	286.4	429.6	572.8	716.0	859.2	1002.4	1145.7	1288.9	1432.1
	60%	0.0	171.8	343.7	515.5	687.4	859.2	1031.1	1202.9	1374.8	1546.6	1718.5
	70%	0.0	200.5	401.0	601.5	802.0	1002.4	1202.9	1403.4	1603.9	1804.4	2004.9

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
80%	0.0	229.1	458.3	687.4	916.5	1145.7	1374.8	1603.9	1833.0	2062.2	2291.3
90%	0.0	257.8	515.5	773.3	1031.1	1288.9	1546.6	1804.4	2062.2	2320.0	2577.7
100%	0.0	286.4	572.8	859.2	1145.7	1432.1	1718.5	2004.9	2291.3	2577.7	2864.1

3.1.6.4 *Fulmar – Autumn migration*

Table 3-39. Potential fulmar mortality following displacement from the OAA in the autumn migration season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	2.1	4.2	6.3	8.3	10.4	12.5	14.6	16.7	18.8	20.8
2%	0.0	4.2	8.3	12.5	16.7	20.8	25.0	29.2	33.4	37.5	41.7
3%	0.0	6.3	12.5	18.8	25.0	31.3	37.5	43.8	50.0	56.3	62.5
4%	0.0	8.3	16.7	25.0	33.4	41.7	50.0	58.4	66.7	75.0	83.4
5%	0.0	10.4	20.8	31.3	41.7	52.1	62.5	73.0	83.4	93.8	104.2
10%	0.0	20.8	41.7	62.5	83.4	104.2	125.1	145.9	166.8	187.6	208.5
15%	0.0	31.3	62.5	93.8	125.1	156.3	187.6	218.9	250.2	281.4	312.7
20%	0.0	41.7	83.4	125.1	166.8	208.5	250.2	291.8	333.5	375.2	416.9
30%	0.0	62.5	125.1	187.6	250.2	312.7	375.2	437.8	500.3	562.9	625.4
40%	0.0	83.4	166.8	250.2	333.5	416.9	500.3	583.7	667.1	750.5	833.9
50%	0.0	104.2	208.5	312.7	416.9	521.2	625.4	729.6	833.9	938.1	1042.3
60%	0.0	125.1	250.2	375.2	500.3	625.4	750.5	875.5	1000.6	1125.7	1250.8
70%	0.0	145.9	291.8	437.8	583.7	729.6	875.5	1021.5	1167.4	1313.3	1459.2
80%	0.0	166.8	333.5	500.3	667.1	833.9	1000.6	1167.4	1334.2	1500.9	1667.7
90%	0.0	187.6	375.2	562.9	750.5	938.1	1125.7	1313.3	1500.9	1688.6	1876.2
100%	0.0	208.5	416.9	625.4	833.9	1042.3	1250.8	1459.2	1667.7	1876.2	2084.6

Table 3-40. Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the autumn migration season.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	2.4	4.9	7.3	9.8	12.2	14.6	17.1	19.5	22.0	24.4
2%	0.0	4.9	9.8	14.6	19.5	24.4	29.3	34.2	39.1	43.9	48.8
3%	0.0	7.3	14.6	22.0	29.3	36.6	43.9	51.3	58.6	65.9	73.2
4%	0.0	9.8	19.5	29.3	39.1	48.8	58.6	68.4	78.1	87.9	97.6
5%	0.0	12.2	24.4	36.6	48.8	61.0	73.2	85.4	97.6	109.9	122.1
10%	0.0	24.4	48.8	73.2	97.6	122.1	146.5	170.9	195.3	219.7	244.1
15%	0.0	36.6	73.2	109.9	146.5	183.1	219.7	256.3	292.9	329.6	366.2
20%	0.0	48.8	97.6	146.5	195.3	244.1	292.9	341.8	390.6	439.4	488.2
30%	0.0	73.2	146.5	219.7	292.9	366.2	439.4	512.6	585.9	659.1	732.3
40%	0.0	97.6	195.3	292.9	390.6	488.2	585.9	683.5	781.2	878.8	976.5
50%	0.0	122.1	244.1	366.2	488.2	610.3	732.3	854.4	976.5	1098.5	1220.6
60%	0.0	146.5	292.9	439.4	585.9	732.3	878.8	1025.3	1171.7	1318.2	1464.7
70%	0.0	170.9	341.8	512.6	683.5	854.4	1025.3	1196.2	1367.0	1537.9	1708.8
80%	0.0	195.3	390.6	585.9	781.2	976.5	1171.7	1367.0	1562.3	1757.6	1952.9
90%	0.0	219.7	439.4	659.1	878.8	1098.5	1318.2	1537.9	1757.6	1977.3	2197.0
100%	0.0	244.1	488.2	732.3	976.5	1220.6	1464.7	1708.8	1952.9	2197.0	2441.1

3.1.6.5 *Fulmar – Winter*

Table 3-41. Potential fulmar mortality following displacement from the OAA in the winter period.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.6	1.3	1.9	2.5	3.2	3.8	4.4	5.1	5.7	6.3
2%	0.0	1.3	2.5	3.8	5.1	6.3	7.6	8.8	10.1	11.4	12.6
3%	0.0	1.9	3.8	5.7	7.6	9.5	11.4	13.3	15.2	17.1	19.0
4%	0.0	2.5	5.1	7.6	10.1	12.6	15.2	17.7	20.2	22.7	25.3
5%	0.0	3.2	6.3	9.5	12.6	15.8	19.0	22.1	25.3	28.4	31.6
10%	0.0	6.3	12.6	19.0	25.3	31.6	37.9	44.2	50.5	56.9	63.2
15%	0.0	9.5	19.0	28.4	37.9	47.4	56.9	66.3	75.8	85.3	94.8
20%	0.0	12.6	25.3	37.9	50.5	63.2	75.8	88.4	101.1	113.7	126.3
30%	0.0	19.0	37.9	56.9	75.8	94.8	113.7	132.7	151.6	170.6	189.5
40%	0.0	25.3	50.5	75.8	101.1	126.3	151.6	176.9	202.1	227.4	252.7
50%	0.0	31.6	63.2	94.8	126.3	157.9	189.5	221.1	252.7	284.3	315.9
60%	0.0	37.9	75.8	113.7	151.6	189.5	227.4	265.3	303.2	341.1	379.0
70%	0.0	44.2	88.4	132.7	176.9	221.1	265.3	309.5	353.8	398.0	442.2
80%	0.0	50.5	101.1	151.6	202.1	252.7	303.2	353.8	404.3	454.8	505.4
90%	0.0	56.9	113.7	170.6	227.4	284.3	341.1	398.0	454.8	511.7	568.5
100%	0.0	63.2	126.3	189.5	252.7	315.9	379.0	442.2	505.4	568.5	631.7

Table 3-42 Potential fulmar mortality following displacement from the OAA plus 2 km buffer in the winter period.

Low = 20% displacement and 1% mortality. High = 20% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.8	1.6	2.4	3.3	4.1	4.9	5.7	6.5	7.3	8.1
2%	0.0	1.6	3.3	4.9	6.5	8.1	9.8	11.4	13.0	14.6	16.3
3%	0.0	2.4	4.9	7.3	9.8	12.2	14.6	17.1	19.5	22.0	24.4
4%	0.0	3.3	6.5	9.8	13.0	16.3	19.5	22.8	26.0	29.3	32.6
5%	0.0	4.1	8.1	12.2	16.3	20.3	24.4	28.5	32.6	36.6	40.7
10%	0.0	8.1	16.3	24.4	32.6	40.7	48.8	57.0	65.1	73.2	81.4
15%	0.0	12.2	24.4	36.6	48.8	61.0	73.2	85.4	97.7	109.9	122.1
20%	0.0	16.3	32.6	48.8	65.1	81.4	97.7	113.9	130.2	146.5	162.8
30%	0.0	24.4	48.8	73.2	97.7	122.1	146.5	170.9	195.3	219.7	244.1
40%	0.0	32.6	65.1	97.7	130.2	162.8	195.3	227.9	260.4	293.0	325.5
50%	0.0	40.7	81.4	122.1	162.8	203.4	244.1	284.8	325.5	366.2	406.9
60%	0.0	48.8	97.7	146.5	195.3	244.1	293.0	341.8	390.6	439.4	488.3
70%	0.0	57.0	113.9	170.9	227.9	284.8	341.8	398.7	455.7	512.7	569.6
80%	0.0	65.1	130.2	195.3	260.4	325.5	390.6	455.7	520.8	585.9	651.0
90%	0.0	73.2	146.5	219.7	293.0	366.2	439.4	512.7	585.9	659.2	732.4
100%	0.0	81.4	162.8	244.1	325.5	406.9	488.3	569.6	651.0	732.4	813.8

3.1.7 Gannet

53. Gannet seasonal displacement mortality predicted within the OAA and the OAA plus 2 km buffer using the matrix approach is presented in **Table 3-43** to **Table 3-50**. The highest displacement impact ('high' impact scenario of 70% displacement and 3% mortality) predicted a displacement mortality of 28.7 gannets in the OAA plus 2 km buffer during the autumn migration period; displacement mortality in the non-breeding season was predicted to be 24.6 birds and in the BDMPS spring migration a mortality of 2.9 birds was predicted in the same area. During the breeding season, the highest impact predicted a displacement mortality of 17.9 birds in the OAA plus 2 km buffer.

3.1.7.1 Gannet – Breeding season

Table 3-43. Potential gannet mortality following displacement from the OAA in the breeding season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.7	1.3	2.0	2.6	3.3	3.9	4.6	5.2	5.9	6.5
2%	0.0	1.3	2.6	3.9	5.2	6.5	7.9	9.2	10.5	11.8	13.1
3%	0.0	2.0	3.9	5.9	7.9	9.8	11.8	13.7	15.7	17.7	19.6
4%	0.0	2.6	5.2	7.9	10.5	13.1	15.7	18.3	20.9	23.6	26.2
5%	0.0	3.3	6.5	9.8	13.1	16.4	19.6	22.9	26.2	29.4	32.7
10%	0.0	6.5	13.1	19.6	26.2	32.7	39.3	45.8	52.3	58.9	65.4
15%	0.0	9.8	19.6	29.4	39.3	49.1	58.9	68.7	78.5	88.3	98.1
20%	0.0	13.1	26.2	39.3	52.3	65.4	78.5	91.6	104.7	117.8	130.8
30%	0.0	19.6	39.3	58.9	78.5	98.1	117.8	137.4	157.0	176.6	196.3
40%	0.0	26.2	52.3	78.5	104.7	130.8	157.0	183.2	209.4	235.5	261.7
50%	0.0	32.7	65.4	98.1	130.8	163.6	196.3	229.0	261.7	294.4	327.1
60%	0.0	39.3	78.5	117.8	157.0	196.3	235.5	274.8	314.0	353.3	392.5
70%	0.0	45.8	91.6	137.4	183.2	229.0	274.8	320.6	366.4	412.2	458.0
80%	0.0	52.3	104.7	157.0	209.4	261.7	314.0	366.4	418.7	471.0	523.4
90%	0.0	58.9	117.8	176.6	235.5	294.4	353.3	412.2	471.0	529.9	588.8
100%	0.0	65.4	130.8	196.3	261.7	327.1	392.5	458.0	523.4	588.8	654.2

Table 3-44. Potential gannet mortality following displacement from the OAA plus 2 km buffer in the breeding season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.9	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5
2%	0.0	1.7	3.4	**5.1**	6.8	8.5	10.2	11.9	13.6	15.3	17.0
3%	0.0	2.6	5.1	7.7	10.2	12.8	15.3	17.9	20.4	23.0	25.6
4%	0.0	3.4	6.8	10.2	13.6	17.0	20.4	23.8	27.3	30.7	34.1
5%	0.0	4.3	8.5	12.8	17.0	21.3	25.6	29.8	34.1	38.3	42.6
10%	0.0	8.5	17.0	25.6	34.1	42.6	51.1	59.6	68.1	76.7	85.2
15%	0.0	12.8	25.6	38.3	51.1	63.9	76.7	89.4	102.2	115.0	127.8
20%	0.0	17.0	34.1	51.1	68.1	85.2	102.2	119.2	136.3	153.3	170.3
30%	0.0	25.6	51.1	76.7	102.2	127.8	153.3	178.9	204.4	230.0	255.5
40%	0.0	34.1	68.1	102.2	136.3	170.3	204.4	238.5	272.5	306.6	340.7

		DISPLACEMENT									
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
50%	0.0	42.6	85.2	127.8	170.3	212.9	255.5	298.1	340.7	383.3	425.8
60%	0.0	51.1	102.2	153.3	204.4	255.5	306.6	357.7	408.8	459.9	511.0
70%	0.0	59.6	119.2	178.9	238.5	298.1	357.7	417.3	476.9	536.6	596.2
80%	0.0	68.1	136.3	204.4	272.5	340.7	408.8	476.9	545.1	613.2	681.3
90%	0.0	76.7	153.3	230.0	306.6	383.3	459.9	536.6	613.2	689.9	766.5
100%	0.0	85.2	170.3	255.5	340.7	425.8	511.0	596.2	681.3	766.5	851.7

3.1.7.2 Gannet – Non-breeding season

Table 3-45. Potential gannet mortality following displacement from the OAA in the non-breeding season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

			DISPLACEMENT									
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	0.9	1.9	2.8	3.8	4.7	5.6	6.6	7.5	8.4	9.4
	2%	0.0	1.9	3.8	5.6	7.5	9.4	11.3	13.1	15.0	16.9	18.8
	3%	0.0	2.8	5.6	8.4	11.3	14.1	16.9	19.7	22.5	25.3	28.1
	4%	0.0	3.8	7.5	11.3	15.0	18.8	22.5	26.3	30.0	33.8	37.5
	5%	0.0	4.7	9.4	14.1	18.8	23.5	28.1	32.8	37.5	42.2	46.9
	10%	0.0	9.4	18.8	28.1	37.5	46.9	56.3	65.7	75.1	84.4	93.8
	15%	0.0	14.1	28.1	42.2	56.3	70.4	84.4	98.5	112.6	126.7	140.7
	20%	0.0	18.8	37.5	56.3	75.1	93.8	112.6	131.4	150.1	168.9	187.6
	30%	0.0	28.1	56.3	84.4	112.6	140.7	168.9	197.0	225.2	253.3	281.5
	40%	0.0	37.5	75.1	112.6	150.1	187.6	225.2	262.7	300.2	337.8	375.3
	50%	0.0	46.9	93.8	140.7	187.6	234.6	281.5	328.4	375.3	422.2	469.1
	60%	0.0	56.3	112.6	168.9	225.2	281.5	337.8	394.1	450.4	506.6	562.9
	70%	0.0	65.7	131.4	197.0	262.7	328.4	394.1	459.7	525.4	591.1	656.8
	80%	0.0	75.1	150.1	225.2	300.2	375.3	450.4	525.4	600.5	675.5	750.6
	90%	0.0	84.4	168.9	253.3	337.8	422.2	506.6	591.1	675.5	760.0	844.4
	100%	0.0	93.8	187.6	281.5	375.3	469.1	562.9	656.8	750.6	844.4	938.2

Table 3-46. Potential gannet mortality following displacement from OAA plus 2 km buffer in the non-breeding season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

			DISPLACEMENT									
		0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
MORTALITY	0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	1%	0.0	1.2	2.3	3.5	4.7	5.9	7.0	8.2	9.4	10.5	11.7
	2%	0.0	2.3	4.7	**7.0**	9.4	11.7	14.1	16.4	18.7	21.1	23.4
	3%	0.0	3.5	7.0	10.5	14.1	17.6	21.1	24.6	28.1	31.6	35.1
	4%	0.0	4.7	9.4	14.1	18.7	23.4	28.1	32.8	37.5	42.2	46.8
	5%	0.0	5.9	11.7	17.6	23.4	29.3	35.1	41.0	46.8	52.7	58.5
	10%	0.0	11.7	23.4	35.1	46.8	58.5	70.3	82.0	93.7	105.4	117.1
	15%	0.0	17.6	35.1	52.7	70.3	87.8	105.4	122.9	140.5	158.1	175.6
	20%	0.0	23.4	46.8	70.3	93.7	117.1	140.5	163.9	187.3	210.8	234.2
	30%	0.0	35.1	70.3	105.4	140.5	175.6	210.8	245.9	281.0	316.1	351.3
	40%	0.0	46.8	93.7	140.5	187.3	234.2	281.0	327.8	374.7	421.5	468.3
	50%	0.0	58.5	117.1	175.6	234.2	292.7	351.3	409.8	468.3	526.9	585.4
	60%	0.0	70.3	140.5	210.8	281.0	351.3	421.5	491.8	562.0	632.3	702.5

	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
70%	0.0	82.0	163.9	245.9	327.8	409.8	491.8	573.7	655.7	737.6	819.6
80%	0.0	93.7	187.3	281.0	374.7	468.3	562.0	655.7	749.3	843.0	936.7
90%	0.0	105.4	210.8	316.1	421.5	526.9	632.3	737.6	843.0	948.4	1053.8
100%	0.0	117.1	234.2	351.3	468.3	585.4	702.5	819.6	936.7	1053.8	1170.9

3.1.7.3 Gannet – Spring migration

Table 3-47. Potential gannet mortality following displacement from the OAA in the spring migration season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
2%	0.0	0.2	0.4	0.6	0.8	1.0	1.3	1.5	1.7	1.9	2.1
3%	0.0	0.3	0.6	0.9	1.3	1.6	1.9	2.2	2.5	2.8	3.1
4%	0.0	0.4	0.8	1.3	1.7	2.1	2.5	2.9	3.3	3.8	4.2
5%	0.0	0.5	1.0	1.6	2.1	2.6	3.1	3.7	4.2	4.7	5.2
10%	0.0	1.0	2.1	3.1	4.2	5.2	6.3	7.3	8.4	9.4	10.5
15%	0.0	1.6	3.1	4.7	6.3	7.8	9.4	11.0	12.6	14.1	15.7
20%	0.0	2.1	4.2	6.3	8.4	10.5	12.6	14.7	16.7	18.8	20.9
30%	0.0	3.1	6.3	9.4	12.6	15.7	18.8	22.0	25.1	28.3	31.4
40%	0.0	4.2	8.4	12.6	16.7	20.9	25.1	29.3	33.5	37.7	41.9
50%	0.0	5.2	10.5	15.7	20.9	26.2	31.4	36.6	41.9	47.1	52.3
60%	0.0	6.3	12.6	18.8	25.1	31.4	37.7	44.0	50.2	56.5	62.8
70%	0.0	7.3	14.7	22.0	29.3	36.6	44.0	51.3	58.6	65.9	73.3
80%	0.0	8.4	16.7	25.1	33.5	41.9	50.2	58.6	67.0	75.3	83.7
90%	0.0	9.4	18.8	28.3	37.7	47.1	56.5	65.9	75.3	84.8	94.2
100%	0.0	10.5	20.9	31.4	41.9	52.3	62.8	73.3	83.7	94.2	104.7

Table 3-48. Potential gannet mortality following displacement from OAA plus 2 km buffer in the spring migration season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

MORTALITY	DISPLACEMENT										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.4
2%	0.0	0.3	0.6	0.8	1.1	1.4	1.7	2.0	2.2	2.5	2.8
3%	0.0	0.4	0.8	1.3	1.7	2.1	2.5	2.9	3.3	3.8	4.2
4%	0.0	0.6	1.1	1.7	2.2	2.8	3.3	3.9	4.5	5.0	5.6
5%	0.0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0
10%	0.0	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6	14.0
15%	0.0	2.1	4.2	6.3	8.4	10.5	12.6	14.7	16.7	18.8	20.9
20%	0.0	2.8	5.6	8.4	11.2	14.0	16.7	19.5	22.3	25.1	27.9
30%	0.0	4.2	8.4	12.6	16.7	20.9	25.1	29.3	33.5	37.7	41.9
40%	0.0	5.6	11.2	16.7	22.3	27.9	33.5	39.1	44.7	50.2	55.8
50%	0.0	7.0	14.0	20.9	27.9	34.9	41.9	48.8	55.8	62.8	69.8
60%	0.0	8.4	16.7	25.1	33.5	41.9	50.2	58.6	67.0	75.4	83.7
70%	0.0	9.8	19.5	29.3	39.1	48.8	58.6	68.4	78.1	87.9	97.7
80%	0.0	11.2	22.3	33.5	44.7	55.8	67.0	78.1	89.3	100.5	111.6
90%	0.0	12.6	25.1	37.7	50.2	62.8	75.4	87.9	100.5	113.0	125.6
100%	0.0	14.0	27.9	41.9	55.8	69.8	83.7	97.7	111.6	125.6	139.5

3.1.7.4 *Gannet – Autumn migration*

Table 3-49. Potential gannet mortality following displacement from the OAA in the autumn migration season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	1.1	2.1	3.2	4.2	5.3	6.3	7.4	8.5	9.5	10.6
2%	0.0	2.1	4.2	6.3	8.5	10.6	12.7	14.8	16.9	19.0	21.2
3%	0.0	3.2	6.3	9.5	12.7	15.9	19.0	22.2	25.4	28.6	31.7
4%	0.0	4.2	8.5	12.7	16.9	21.2	25.4	29.6	33.9	38.1	42.3
5%	0.0	5.3	10.6	15.9	21.2	26.4	31.7	37.0	42.3	47.6	52.9
10%	0.0	10.6	21.2	31.7	42.3	52.9	63.5	74.1	84.6	95.2	105.8
15%	0.0	15.9	31.7	47.6	63.5	79.3	95.2	111.1	127.0	142.8	158.7
20%	0.0	21.2	42.3	63.5	84.6	105.8	127.0	148.1	169.3	190.4	211.6
30%	0.0	31.7	63.5	95.2	127.0	158.7	190.4	222.2	253.9	285.7	317.4
40%	0.0	42.3	84.6	127.0	169.3	211.6	253.9	296.2	338.6	380.9	423.2
50%	0.0	52.9	105.8	158.7	211.6	264.5	317.4	370.3	423.2	476.1	529.0
60%	0.0	63.5	127.0	190.4	253.9	317.4	380.9	444.4	507.8	571.3	634.8
70%	0.0	74.1	148.1	222.2	296.2	370.3	444.4	518.4	592.5	666.5	740.6
80%	0.0	84.6	169.3	253.9	338.6	423.2	507.8	592.5	677.1	761.8	846.4
90%	0.0	95.2	190.4	285.7	380.9	476.1	571.3	666.5	761.8	857.0	952.2
100%	0.0	105.8	211.6	317.4	423.2	529.0	634.8	740.6	846.4	952.2	1058.0

Table 3-50. Potential gannet mortality following displacement from the OAA plus 2 km buffer in the autumn migration season.

Low = 70% displacement and 1% mortality. High = 70% displacement and 3% mortality.

	DISPLACEMENT										
MORTALITY	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0.0	1.4	2.7	4.1	5.5	6.8	8.2	9.6	10.9	12.3	13.7
2%	0.0	2.7	5.5	8.2	10.9	13.7	16.4	19.2	21.9	24.6	27.4
3%	0.0	4.1	8.2	12.3	16.4	20.5	24.6	28.7	32.8	36.9	41.0
4%	0.0	5.5	10.9	16.4	21.9	27.4	32.8	38.3	43.8	49.2	54.7
5%	0.0	6.8	13.7	20.5	27.4	34.2	41.0	47.9	54.7	61.6	68.4
10%	0.0	13.7	27.4	41.0	54.7	68.4	82.1	95.8	109.4	123.1	136.8
15%	0.0	20.5	41.0	61.6	82.1	102.6	123.1	143.6	164.2	184.7	205.2
20%	0.0	27.4	54.7	82.1	109.4	136.8	164.2	191.5	218.9	246.2	273.6
30%	0.0	41.0	82.1	123.1	164.2	205.2	246.2	287.3	328.3	369.4	410.4
40%	0.0	54.7	109.4	164.2	218.9	273.6	328.3	383.0	437.8	492.5	547.2
50%	0.0	68.4	136.8	205.2	273.6	342.0	410.4	478.8	547.2	615.6	684.0
60%	0.0	82.1	164.2	246.2	328.3	410.4	492.5	574.6	656.7	738.7	820.8
70%	0.0	95.8	191.5	287.3	383.0	478.8	574.6	670.3	766.1	861.9	957.6
80%	0.0	109.4	218.9	328.3	437.8	547.2	656.7	766.1	875.5	985.0	1094.4
90%	0.0	123.1	246.2	369.4	492.5	615.6	738.7	861.9	985.0	1108.1	1231.2
100%	0.0	136.8	273.6	410.4	547.2	684.0	820.8	957.6	1094.4	1231.2	1368.0

3.2 Predicted guillemot and razorbill displacement mortalities generated by SeabORD

54. For guillemot, the greatest reduction in survival occurred at Sule Skerry and Sule Stack SPA, followed by North Caithness Cliffs SPA. For puffin, greatest reductions in survival were also seen at Sule Skerry and Sule Stack SPA, followed by Hoy SPA (**Table 3-51**). These results are as expected given the proximity of Sule Skerry and Sule Stack SPA to the offshore Project area. The apparent increase in adult puffin survival at Cape Wrath SPA is potentially due to displaced birds foraging closer to the colony or abandoning their breeding attempt, leading the model to predict higher adult survival. See **Annex 4A: SeabORD Analysis Final Report** for more results and a more detailed explanation and interpretation of results.

Table 3-51. Mean percentage point reduction in adult and chick survival rate for guillemot and puffin, by SPA, caused by displacement from the OAA plus a 2 km buffer, as predicted by SeabORD, assuming a moderate prey year. See Table 3.1 to Table 3.4 in Annex 4A: SeabORD Analysis Final Report for more details.

Species	SPA	Percentage point reduction in survival	
		Adult	Chick
Guillemot	Sule Skerry and Sule Stack	0.302	2.277
	North Caithness Cliffs	0.184	0.872
	Hoy	0.170	0.794
	Marwick Head	0.106	0.398
	Rousay	0.072	0.430
	Cape Wrath	0.128	0.666
	West Westray	0.034	0.354
Puffin	Sule Skerry and Sule Stack	0.495	0.742
	North Caithness Cliffs	0.261	0.196
	Hoy	0.400	0.267
	Cape Wrath	-0.179	0.179

4 SUMMARY OF DISPLACEMENT MORTALITIES TAKEN INTO THE IMPACT ASSESSMENT

4.1 Comparison between matrix approach and SeabORD

55. It is not possible to make a direct comparison of displacement mortality predicted by the displacement matrix approach with SeabORD outputs. This is because the two approaches rely on very different assumptions and produce different outputs, the former providing an estimate of total mortality of displaced birds of all ages using the OAA plus 2 km buffer, whereas the latter estimating reductions in chick and adult survival at individual SPAs.

56. The outputs of the displacement matrix approach were used in the impact assessment. All breeding season mortality for guillemot and puffin was apportioned to Sule Skerry and Sule Stack SPA due to the boundary of this SPA overlapping with the OAA plus 2 km buffer, i.e. it was assumed that all adult breeding guillemots and puffins using the OAA plus 2 km buffer were from the Sule Skerry and Sule Stack SPA. This was discussed and agreed with NatureScot on 28 May 2024 in a consultation meeting. This assumption results in quite different impacts on SPA populations from those predicted by SeabORD (**Table 3-51**) which suggest other SPAs would also be impacted by the Project during the breeding season.

4.2 Displacement mortality predicted using the matrix approach

57. A summary predicted seabird mortality from displacement from the matrix approach for each species and season for the OAA and the OAA plus 2 km buffer is presented in **Table 4-1.** These estimates of displacement mortality were used in the EIA and HRA assessments, presented in the **Addendum to the Offshore EIA Report** and **Addendum to the RIAA.**

Table 4-1. Summary of predicted seasonal displacement impacts (number of mortalities per annum) from displacement within the OAA and the OAA plus 2 km buffer for LOW and HIGH displacement/mortality values for each species. Annual total is the sum of the breeding and non-breeding season estimates

		OAA		OAA plus 2km buffer	
Kittiwake	Breeding	2.5	7.6	3.3	10.0
	Non-breeding	2.8	8.3	3.7	11.0
	Spring Migration	2.8	8.3	3.7	11.0
	Autumn Migration	1.8	5.3	2.4	7.2
	Annual total	**5.3**	**15.9**	**7.0**	**21.0**
Arctic tern	Breeding	1.1	1.9	1.1	1.9
	Non-breeding	0.0	0.0	0.0	0.0
	Spring Migration	0.0	0.1	0.0	0.1
	Autumn Migration	0.3	0.5	0.4	0.7

		OAA		OAA plus 2km buffer	
	Annual total	**1.1**	**1.9**	**1.1**	**1.9**
Guillemot	Breeding	95.0	158.3	143.5	239.2
	Non-breeding	19.2	57.5	26.4	79.1
	Annual total	**114.2**	**215.8**	**169.9**	**318.3**
Razorbill	Breeding	2.0	3.3	2.5	4.2
	Non-breeding	0.6	1.8	0.8	2.4
	Spring Migration	0.5	1.5	0.8	2.4
	Autumn Migration	0.6	1.8	0.7	2.0
	Winter	0.0	0.1	0.1	0.3
	Annual total	**2.6**	**5.1**	**3.3**	**6.6**
Puffin	Breeding	75.8	126.3	94.9	158.2
	Non-breeding	9.1	27.4	12.8	38.4
	Annual total	**84.9**	**153.7**	**107.7**	**196.6**
Fulmar	Breeding	2.3	7.0	3.1	9.2
	Non-breeding	4.5	13.4	5.7	17.2
	Spring Migration	3.3	9.8	5.7	17.2
	Autumn Migration	4.2	12.5	4.9	14.6
	Winter	1.3	3.8	1.6	4.9
	Annual total	**6.8**	**20.4**	**8.8**	**26.4**
Gannet	Breeding	4.6	13.7	6.0	17.9
	Non-breeding	6.6	19.7	8.2	24.6
	Spring Migration	0.7	2.2	1.0	2.9
	Autumn Migration	7.4	22.2	9.6	28.7
	Annual total	**11.2**	**33.4**	**14.2**	**42.5**

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