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Application Document 16

Appendix 16-2 Caledonia South Compensation Long List and Short List

Caledonia Offshore Wind Farm Ltd

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Acronyms and Abbreviations

AEoSI	Adverse Effect on Site Integrity
AOB	Apparently Occupied Burrows
AON	Apparently Occupied Nests
ANS	Artificial Nesting Structure
BTO	British Trust for Ornithology
CRM	Collision Risk Modelling
HRA	Habitat Regulation Appraisal
HPAI	High Pathogenicity Avian Influenza
IMP	Implementation and Monitoring Plan
JNCC	Joint Nature Conservation Committee
MMFR	Mean Max Foraging Range
OWF	Offshore Wind Farm
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
SD	Standard Deviation
SMP	Seabird Monitoring Programme
SPA	Special Protected Area

1 Introduction

1.1 Project Background

1.1.1.1 This appendix provides the proposed compensation long list and short list for the Proposed Development (Offshore), specifically to inform the Caledonia South application, located in the Moray Firth, Scotland. This appendix supports the Caledonia South Derogation Case (Application Document 16: Caledonia South Habitats Regulations Appraisal Derogation Case).

1.1.1.2 The Proposed Development (Offshore) will be developed in two phases (see Volume 1, Chapter 5: Proposed Development Phasing), referred to as Caledonia North and Caledonia South. The Array Areas of the two phases are referred to as the Caledonia North Site and the Caledonia South Site, with the combined Array Areas referred to as the Caledonia Offshore Wind Farm (OWF). It is assumed that construction of the two application areas could be progressed in either order (e.g., Caledonia North constructed in the first phase, then Caledonia South in the second phase, or vice-versa) or at the same time. This has been assessed within a single Report to Inform Appropriate Assessment (RIAA) covering Caledonia North and Caledonia South in isolation, as well as the Proposed Development (Offshore) (i.e., Caledonia North and Caledonia South combined).

1.2 Derogation

1.2.1.1 The Caledonia South RIAA (Application Document 14), through apportioning, in-combination assessments and population viability analysis (PVA), concluded that the Proposed Development (Offshore) could have an Adverse Effect on Site Integrity (AEoSI) on a number of Special Protection Area (SPA) seabird populations when impacts from the Proposed Development (Offshore) are considered in-combination with other projects. For this reason, the application for Caledonia South is supported by a derogation case, including the development of compensation measures for black-legged kittiwake (hereafter kittiwake) *Rissa tridactyla*, northern gannet (hereafter gannet) *Morus bassanus*, common guillemot (hereafter guillemot) *Uria aalge* and Atlantic Puffin (hereafter puffin) *Fratercula arctica*. For guillemot and puffin, this derogation case is without prejudice, based on the fact that the Applicant Approach in the RIAA concluded no AEoSI for those two species (see section 2.3).

1.3 Compensation Measure Development

1.3.1.1 To ensure the coherence of the site network, compensatory measures could be needed to ensure the ability of the UK/national site network, and necessary supporting habitat, to support the overall UK breeding population of the impacted species are not reduced as a result of the construction and operation of the Proposed Development (Offshore).

1.3.1.2 The Scottish Government's Marine Directorate produced process guidance on ornithological compensatory measure development for offshore wind (DTA, 2021[1]), including a proposed stepwise approach to the identification and delivery of compensation measures (Figure 1-1).

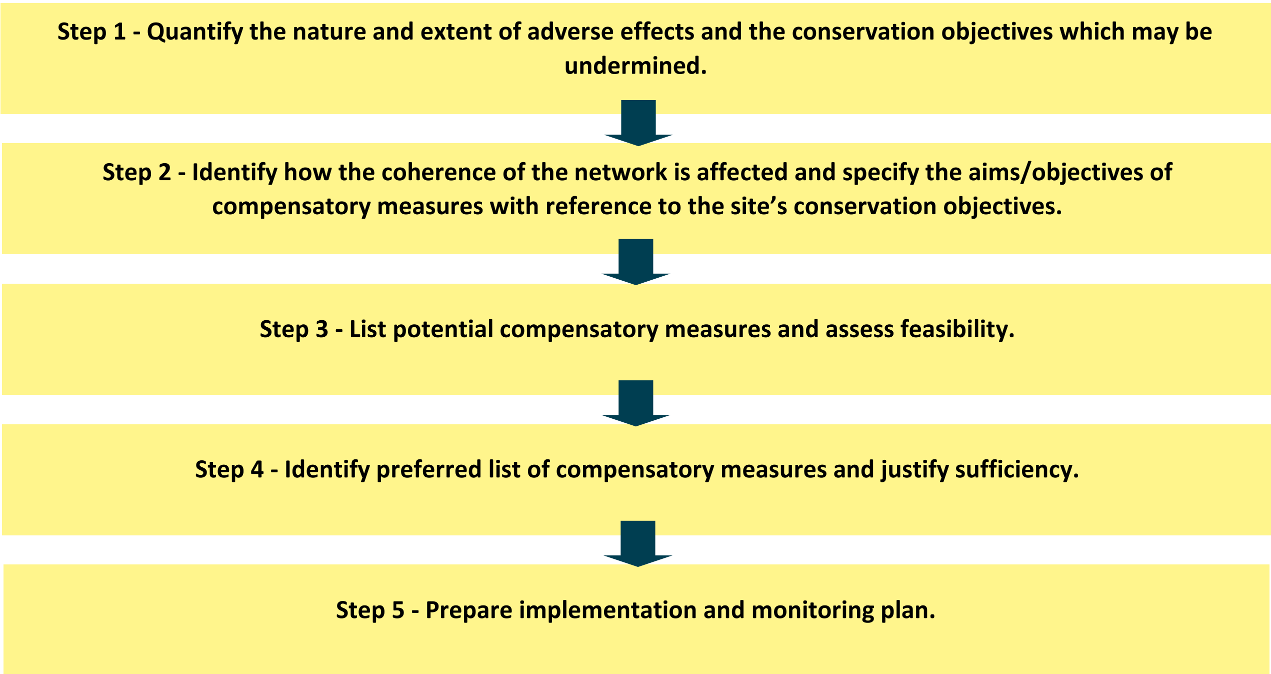

Figure 1-1: Stepwise approach to the identification and delivery of compensatory measures, as proposed in the Marine Directorate's guidance on ornithological compensatory measure development for offshore wind (adapted from DTA, 2021[1]).

1.3.1.3 Caledonia Offshore Wind Farm Ltd (the Applicant) has applied the DTA (2021[1]) framework to develop compensation measures for the Proposed Development (Offshore). Step 1 of the work (see Figure 1-1) is quantified as part of the completion of collision risk modelling (CRM), distributional responses assessment, apportioning and PVA (conducted as part of the Habitats Regulations Appraisal (HRA) process for the Proposed Development (Offshore)).

1.3.1.4 This Caledonia South Compensation Long List and Short List document focuses on progressing the remainder of Step 1 (outlining conservation objectives which may be undermined), Step 2, Step 3 and 4.

1.3.1.5 Step 5 builds upon the information from Step 1 to 4 presented in this Long List and Short List report, and is found within the following documents:

- Caledonia South Compensation Plan and Site Selection (Application Document 16, Appendix 16-3) containing detailed information on the shortlisted compensation measures, including ecological effectiveness, wider ecological considerations, timing of delivery, monitoring requirements, adaptive management requirements and feasibility; and

- Caledonia South Outline Implementation and Monitoring Plan (Application Document 16, Appendix 16-4).

1.4 Document Purpose

1.4.1.1 This document sets out and discusses:

- The methodology for longlisting and shortlisting of compensation options - Section 2;
- The nature and extent of adverse effects and the conservation objectives which may be undermined (Step 1) – Section 2.3;
- For each at-risk species, an ecological description and information on pressures facing the species, including details on threats faced by the species, and context on population size, distribution and trends to inform links to network coherence (i.e., a connected, coherent ecological network of SPAs for the qualifying species) (Step 2) - Section 4;
- Potential compensatory measures for kittiwake, gannet, guillemot and puffin, with their feasibility assessed (Step 3). This is presented in the form of a long list and accompanying information/discussion – Section 5; and
- A preferred list of compensatory measures, selected from the long list, with their feasibility and sufficiency justified (Step 4). This is presented in the form of a short list and accompanying information/discussion – Section 6.

1.4.1.2 It should be noted that in addition to, or instead of, the developer-led measures shortlisted here, the Applicant would consider contributing to a strategic compensation fund or regional compensation measures as and when a pathway comes available (see also Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection).

2 Methodology

2.1 Overview

2.1.1.1 In this section the methodology for longlisting and shortlisting are outlined, with reference to the relevant guidance where applicable.

2.2 Guidance

2.2.1.1 As discussed in Section 1.3, the framework for ornithological compensatory measures for offshore wind provided in DTA (2021[1]) is the currently applicable guidance for developers in Scotland. In this document, this guidance was applied to develop a long list and short list of measures for each key species for Caledonia OWF (see Section 1.3 for further information on the stepwise process).

2.2.1.2 The scope of potentially appropriate compensation options considered in the long list was informed by the European Commission Managing Natura 2000 guidance (European Commission, 2019[2]), which states that compensatory measures can consist of (but need not necessarily be limited to):

- Habitat improvement in existing sites;
- Habitat re-creation;
- In association with other works, proposing a new site under the Habitats and Birds Directive;
- Species reintroduction;
- Species recovery and reinforcement;
- Land purchase;
- Rights acquisition;
- Reserve creation (including strong restrictions in use);
- Incentives for certain economic activities that sustain key ecological functions; and
- Reduction of (other) threats, usually upon species, either through action on a single source or though coordinated action on all threat factors.

2.3 Adverse effects and conservation objectives

2.3.1.1 Predicted impacts on sites and species were quantified as part of the HRA process through apportioning, in-combination assessments and PVA as caried out as part of the RIAA (Application Document 14: Caledonia South Report to Inform Appropriate Assessment), and are shown in Section 3 and Table 3-1 of this report.

2.3.1.2 For sites deemed at risk of being impacted by the Proposed Development, NatureScot's SiteLINK (NatureScot, 2024[3]) was used to obtain information on the site's conservation objectives in order to identify those deemed at risk to be undermined or compromised due to impacts from the Proposed Development, with findings presented in Section 3 and Table 3-1.

2.4 Ecology and Impacts on Network Coherence

2.4.1.1 The aim of this part of the work is to provide information on key species ecology, Scottish population trends, known pressures, and overall network coherence to aid in in understanding the suitability and potential benefits of compensation measures. To outline the ecology and known pressure for each species, information from the scientific literature was collated.

2.4.1.2 Population trends and links to site network coherence for each species were determined through the Seabird 2000 census (Mitchell *et al.*, 2004[4]), Seabird Count (2015-2021) (Burnell *et al.*, 2023[5]), the Joint Nature Conservation Committee (JNCC, 2021[6]), and the British Trust for Ornithology (BTO) Seabird Monitoring Programme (SMP, 2024[7]). Findings are presented in Section 4.

2.5 Long List Development and Feasibility Assessment

2.5.1.1 An initial strategic long list for the Northeast and East ScotWind Projects was developed by Royal HaskoningDHV and HiDef through a combination of literature review followed by stakeholder workshops to refine the list (Royal HaskoningDHV, 2024[8]). The literature review relied upon existing reviews of potential compensation measure for SPA seabird populations (such as (Furness *et al.*, 2013[9]; DTA, 2020[10]; Furness, 2021[11]; McGregor *et al.*, 2022a[12]) as well as compensation measures proposed by other offshore wind farms (OWF) throughout the UK. Based on the findings from the plan-level HRA on species identified to be most likely to be subject to adverse effects, Royal HaskoningDHV (2024[8]) focused their search for compensation measures for kittiwake, gannet, guillemot and puffin (i.e., the same species as are the focus of this long list and short list report). The compensation measures within the long lists were designed to increase recruitment into key species populations by enhancing productivity and survival.

2.5.1.2 This strategic long list from Royal HaskoningDHV (2024[8]) was used to inform the compensation option long list produced here for the Proposed Development, with a number of additional options added based on literature research and discussions with stakeholders.

2.5.1.3 The report by Royal HaskoningDHV (2024[8]) assessed the presented long list of compensation options to identify shortlisted options. However, the feasibility assessment approach and resulting shortlisted options are not necessarily optimal or suitable for compensation delivery for single projects, as the focus of Royal HaskoningDHV (2024[8]) was to identify projects suitable for strategic delivery specifically.

2.5.1.4 It was therefore decided that the assessment of feasibility and resulting shortlisting of long list options was to be undertaken independently, using tailored assessment criteria, for the Proposed Development in this report.

2.5.1.5 As per the DTA (2021[1]) guidance, "*as a minimum feasibility should be assessed in terms of technical, financial and legal consideration*". DTA (2021[1]) also provides a checklist for compensatory measures which sets out the following questions to check the feasibility of potential compensatory measures, in addition to an assessment of feasibility from a technical, financial and legal perspective:

- "Is the measure deliverable?"
- "Is the measure ecologically effective (i.e., sufficient)?"
- "Will the measure be effective before adverse effects arise?"
- "Can the measure be secured?"
- "Can the success of the measure be monitored?"
- "How have uncertainties been addressed?"

2.5.1.6 A list of feasibility assessment categories was created by the Applicant, using these DTA (2021[1]) requirements for feasibility assessment and the checklist of questions. The categories against which all longlisted options were assessed were:

- Technical feasibility;
- Financial feasibility;
- Legal feasibility;
- Timing of delivery (i.e., is there an anticipated lead-in time before the measure is effectively delivering compensation, due to ecological, logistical or technical reasons);
- Ecological feasibility (i.e., is there evidence that the species is impacted by the threat which the measure looks to address);
- Monitoring feasibility (i.e., can the measure be effectively monitored); and
- Other feasibility considerations (any other concerns/limitations around delivering and securing the measure).

2.5.1.7 The Applicant notes here that whilst addressing uncertainties (the last question from DTA (2021[1]) set out in paragraph 2.5.1.5) is not included as an assessment criteria in this long list and short list report, plans for adaptive monitoring and adaptive management will be developed for compensation measures taken forward, and such adaptive management plans will be included in Implementation and Monitoring Plan(s) for the selected measure(s). It is not included at this stage as the Applicant deems it necessary to first short list options and progress site selection in order to be able to identify appropriate adaptive management options.

2.5.1.8 Following the design of the feasibility assessment categories (paragraph 2.5.1.6), all longlisted compensation options were evaluated against those categories, with findings presented in Section 5 and Table 7-1.

2.5.1.9 It should be noted that at this stage the suitability of the compensation measures has been considered within the specific context of north and northeast coast of Scotland, the general geographic area within which the Proposed Development is located, and where compensation would ideally be delivered (subject to feasibility). Further refinement of the exact delivery location(s) is to be completed as part of compensation site selection, which is the Applicant's proposed next step in the compensation development process following the completion of the short list. This site selection work is envisaged to include site-specific considerations for the shortlisted compensation options.

2.6 Shortlisting

2.6.1.1 Following consideration of all longlisted options against the feasibility information gathered as part of the longlisting and feasibility assessment, the options deemed most feasible were selected as shortlisted compensation options to take forward for further development. The shortlisted options are presented in Section 6.

3 Adverse Effects and Conservation Objectives

3.1.1.1 Table 3-1 lists the sites and species for which AEoSI could not be ruled out, as per the RIAA conclusions (Application Document 14: Caledonia South Report to Inform Appropriate Assessment). For each potentially impacted species and site, the nature of the potential effect (collision and/or displacement), and the conservation objectives at risk are detailed. Predicted effects (adult mortality per annum for the projects alone) are shown in Table 3-2.

Table 3-1: Species, site, nature of potential effect and the conservation objects at risk for the sites for which Adverse Effects on Site Integrity (AEoSI) could not be ruled out in-combination with other projects for the Proposed Development (Offshore).

Designated Feature	Site	Distance to Caledonia OWF (km)	Nature of Potential Effect	Conservation Objectives at Risk
Kittiwake	East Caithness Cliffs SPA	51.5	Collision mortality and distributional response	Population of the species as a viable component of the site
	Troup, Pennan and Lion's Heads SPA	59.8	Collision mortality and distributional response	Population of the species as a viable component of the site
	Buchan Ness to Collieston Coast SPA	102.4	Collision mortality and distributional response	Population of the species as a viable component of the site
Gannet	Forth Islands SPA	268.7	Collision mortality and distributional response	Population of the species as a viable component of the site
Guillemot	East Caithness Cliffs SPA	51.5	Distributional response	Population of the species as a viable component of the site
Puffin	Sule Skerry and Sule Stack SPA	154.8	Distributional response	Population of the species as a viable component of the site

Table 3-2: Project alone predicted additional annual mortality, for those sites and species for which Adverse Effects on Site Integrity could not be ruled out in-combination with other projects for the Proposed Development (Offshore), presenting the lower and upper limits of the Guidance Approach.

Species	Site	Scale of Potential Effect (Predicted Additional Annual Adult Mortality) – Guidance Approach			Scale of Potential Effect (Predicted Additional Annual Adult Mortality) – Applicant Approach		
		Proposed Development (Offshore)	Caledonia North	Caledonia South	Proposed Development (Offshore)	Caledonia North	Caledonia South
Kittiwake	East Caithness Cliffs SPA	15.88 - 19.05	5.85 - 7.01	12.16 - 14.55	N/A*	N/A*	N/A*
	Troup, Pennan & Lion's Head SPA	6.48 - 7.77	2.38 - 2.85	4.96 - 5.94	N/A*	N/A*	N/A*
	Buchan Ness to Collieston Coast SPA	2.31 – 2.77	0.88 - 1.06	1.75 - 2.10	N/A*	N/A*	N/A*
	Total	24.67 - 29.59	9.11 - 74.01	18.87 - 22.59	N/A*	N/A*	N/A*
Guillemot	East Caithness Cliffs SPA	124.19 – 222.16**	53.04 - 91.64	89.19 - 161.75	No AEoSI***	No AEoSI***	No AEoSI***
Puffin	Sule Skerry and Sule Stack SPA	11.03 -18.37	7.00 - 11.68	6.47 - 10.78	No AEoSI***	No AEoSI***	No AEoSI***
Gannet (Guidance Approach to macro-avoidance)[1]	Forth Islands SPA	4.48 - 8.12	1.66 - 3.00	3.51 - 6.13	4.48	1.66	3.51
Gannet (Applicant Approach to macro-avoidance)[2]	Forth Islands SPA	2.74 – 6.38	1.06 – 2.40	2.03 – 4.66	2.74	1.06	2.03

Species	Site	Scale of Potential Effect (Predicted Additional Annual Adult Mortality) – Guidance Approach			Scale of Potential Effect (Predicted Additional Annual Adult Mortality) – Applicant Approach		
		Proposed Development (Offshore)	Caledonia North	Caledonia South	Proposed Development (Offshore)	Caledonia North	Caledonia South

Applicant Approach impacts shown where applicable. Full details available in the Caledonia South RIAA (see Application Document 14).

[1] As agreed in consultation a macro-avoidance rate of 70% has been applied to gannet densities during the non-breeding season. During the breeding season, the monthly in-flight densities have not been adjusted for macro-avoidance. This approach has been presented as the Guidance Approach.

[2] The Applicant Approach has also been presented, with the 70% macro-avoidance rate applied to the predicted mortalities in all months.

* No Applicant approach submitted for kittiwake; **Only upper limited of Guidance Approach reached AEoSI in-combination with other projects for the Proposed Development (Offshore); ***No effect predicted as AEoSI ruled out in-combination with other projects for the Proposed Development (Offshore) for the Applicant Approach – full predicted mortality figures, including for those instances where AEoSI was ruled out, available in RIAA.

4 Ecology and Impacts on Network Coherence

4.1 Kittiwake

4.1.1 Species Overview

4.1.1.1 Kittiwakes are small (38-40 cm long) surface feeding gulls (Coulson, 2011[13]; del Hoyo *et al.*, 1996[14]). During the breeding season (mid-April to August) (NatureScot, 2020[15]), the species predominantly feeds on energy rich prey such as sandeel (*Ammodytes* sp), sprat (*Sprattus sprattus*) and juvenile herring (*Clupea harengus*) (Lewis *et al.*, 2001[16], Bull *et al.*, 2004[17], Wanless, 2018[18]). As surface feeders, these birds are sensitive to changes in prey availability within the water column (Furness and Tasker, 2000[19]).

4.1.1.2 Kittiwake are currently Red-listed under the UK Birds of Conservation Concern (Stanbury *et al.*, 2021[20]). The current main drivers of kittiwake population decline across their range are considered to be reductions in food abundance (fisheries depletion of stock and reduction in available fishery discards (Gill and Hatch, 2002[21], Frederiksen *et al.*, 2004[22], Votier *et al.*, 2013[23]) and climate change (Frederiksen *et al.*, 2007[24], Sandvik *et al.*, 2014[25]). The Highly Pathogenic Avian Influenza (HPAI) resulted in mortalities in adult kittiwakes at Scottish SPAs and beyond (NatureScot, 2023[26]; 2023[27]). Trends are highly variable between Scottish SPA colonies that have kittiwake as a qualifying feature, with population trends since the pre-HPAI baseline, ranging from substantial increases to declines as high as 83% (Tremlett *et al.*, 2024[28]). Kittiwake are within the top 50% of the most sensitive seabird species to suffer bycatch from surface fishery gear (Bradbury *et al.*, 2017[29]). Plastic pollution and associated entanglement risk has also been raised as a concern; plastic debris has been recorded in 57.2% of kittiwake nests at Bulbjerg colony in 2005 (Hartwig *et al.*, 2007[30]; Ryan, 2018[31]). Plastic was also found in regurgitated stomach contents of 7.9% of kittiwake nestlings at four Irish colonies (Acampora *et al.* 2017[32]). Furthermore, at some colonies, visitor disturbance can cause the decline of breeding success as observed in St Abbs Head (Beale and Monaghan, 2004[33]).

4.1.2 Link to Site Network Coherence

4.1.2.1 The UK breeding kittiwake population comprises 8% of the world population (JNCC, 2021[6]). The Seabirds Count from 2015-2021 (Burnell *et al.*, 2023[5]) estimated a total of 215,913 AON breeding in the UK. The majority of the UK breeding population is situated within Scotland, with 121,082 AON recorded by the Seabirds Count (Burnell *et al.*, 2023[5]). This represents a decrease of by 57% since the Seabird 2000 Count (1998-2002) (Burnell *et al.*, 2023[5]).

4.1.2.2 In Scotland, kittiwake colonies are located primarily around Orkney, Shetland and the East Coast (Mitchell *et al.*, 2004[4], BTO, 2024[7]). SPAs with kittiwake colonies are found around the Scottish coasts, with few SPAs with kittiwake colonies located in other countries in the UK (BTO, 2024[7]).

4.1.2.3 During the breeding season, breeding birds can travel widely to forage, with a mean maximum foraging range ± standard deviation (MMFR±1SD) of 156 ±114.5km (Woodward *et al.,* 2019[34]).

4.1.2.4 Table 3-1 shows the conservation objectives for the designated bird features at each protected site of concern. Impacts from the Proposed Development (Offshore) have the potential to undermine those listed conservation objectives of SPAs where kittiwake is a qualifying feature, with direct mortality (collision risk) and energetic impacts (displacement effects) thereby potentially reducing the ability of the network to support a viable kittiwake population (i.e., impacting site network coherence).

4.1.2.5 For each SPA site for which the RIAA concluded a potential for AEoSI for kittiwake, population counts and the proportion of UK population hosted at the site (based on Seabirds Count 2015-21 data, Burnell *et al.* 2023[5]) are shown here to further clarify the importance of each site to the network:

- East Caithness Cliffs SPA
  - Population size: 24,479 AON
  - Proportion of UK population: 11.3 %
- Troup, Pennan & Lion’s Head SPA
  - Population size: 10,616 AON
  - Proportion of UK population: 4.9%
- Buchan Ness to Collieston Coast SPA
  - Population size: 11,295 AON
  - Proportion of UK population: 5.2%

4.2 Gannet

4.2.1 Species Overview

4.2.1.1 Northern gannet (hereafter gannet) are the largest pelagic seabird in the North Atlantic, forming large colonies during the breeding season (mid-March to September) (NatureScot, 2020[15]). The species are plunge divers which are able to exploit a variety of fish species and sizes such as sandeels, mackerel, and herring, with birds also able to exploit commercial fishery discards, where occurring (Hamer *et al.*, 2000[35], Votier *et al.*, 2010[36]).

4.2.1.2 Gannet are currently Amber-listed on the UK Birds of Conservation Concern List (Stanbury *et al.*, 2021[20]). Gannet were severely impacted by the 2021-

2022 HPAI outbreak, with a significant decline in population numbers, breeding success and survival recorded at locations such as Bass Rock (Lane *et al.*, 2023[37]). All Scottish SPA colonies that have gannet as a qualifying feature have shown declines since the pre-HPAI baseline, with declines ranging from 3 to 37% (Tremlett *et al.*, 2024[28]). Anecdotal evidence is showing the population may be showing good recovery in places from declines caused by HPAI due to substantial immature recruitment into breeding populations, but formal study results are needed to fully understand current trends. Another key pressure faced by gannet is bycatch from fisheries, with UK longline fisheries likely to catch hundreds of gannets per year, as well as visitor disturbance causing a reduction in successful nests (Allbrook and Quinn, 2020[38]; Northridge *et al.*, 2020[39]; Ramírez *et al.,* 2024[40]).

4.2.2 Link to Site Network Coherence

4.2.2.1 The UK breeding gannet population is 55.6% of the world population (293,200 AON) according the Gannet Census (2013-2015) (JNCC, 2021[6], Burnell *et al.*, 2023[5]). Scotland holds 70% of the UK population (243,505 AON), with gannetries found around the coasts of Scotland (BTO, 2024[7]). This includes the world's largest gannet colony at Bass Rock, in the Firth of Forth (75,259 AON in 2014) (JNCC, 2021[6]). The 2023 Scottish count represents an increase of 40% AON since the 1998 to 2002 gannet census (Burnell *et al.*, 2023[5]).

4.2.2.2 Breeding adults can range widely during the breeding season, reflected by their MMFR±1SD of 315.2±194.2km (Woodward *et al.*, 2019[34]).

4.2.2.3 Table 3-1 shows the conservation objectives for the designated bird features at each protected site of concern. Predicated impacts from the Proposed Development (Offshore) have the potential to undermine those listed conservation objectives of SPAs where gannet is a qualifying feature, with direct mortality (collision risk) and energetic impacts (displacement effects) potentially reducing the ability of the network to support a viable gannet population (i.e., impacting site network coherence).

4.2.2.4 For each SPA site for which the RIAA concluded a potential for AEoSI for gannet, population counts and the proportion of UK population hosted at the site (based on Seabirds Count 2015-21 data, Burnell *et al.* 2023[5]) are shown here to further clarify the importance of each site to the network:

- Forth Islands SPA:
  - Population size: 75,259 (AON)
  - Proportion of UK population: 24.7%

4.3 Guillemot

4.3.1 Species Overview

4.3.1.1 Guillemot are cliff nesting seabirds, nesting in dense colonies between April to mid- August (NatureScot, 2020[15]). Guillemot are pursuit divers which tend to forage near the coast, feeding on *Ammodytidae*, *Clupeidae* and *Gadidae* (Frederiksen *et al.*, 2008[41], Anderson *et al.*, 2014[42]).

4.3.1.2 Guillemot are currently Amber-listed under the UK Birds of Conservation Concern (Stanbury *et al.*, 2021[20]). This species is vulnerable to the changes in prey availability through rising sea surface temperatures (SST) (Anderson *et al.*, 2014[42]; Daunt and Mitchell, 2013[43]). HPAI is also thought to have substantially impacted the species, with the total number of guillemots across all sites surveyed in 2023 (52% of the population was surveyed) reported to have shown a decrease of 6% compared to the pre-HPAI baseline count for these colonies (from 694,261 to 650,375 IND), though considerable variation in changes between colonies was observed (Tremlett *et al.*, 2024[28]). At nine Scottish SPAs where guillemot is a qualifying feature, populations decreased by between 15% and 91% since the pre-HPAI baseline, with no change or population growth recorded for the other nine SPA populations (Tremlett *et al.*, 2024[28]). Mammalian predation of guillemot can also cause declines in populations; following the removal of the brown and black rat on Lundy Island (2002-2004), guillemot population increased by 321% between 2002 and 2021 (Ørsted, 2021[44]). Furthermore, this species is highly sensitive to bycatch from UK fisheries and to visitor disturbance at colonies (Bradbury *et al.*, 2017[29]; Beale and Monahan, 2004[33]; Northridge *et al.*, 2020[39]; Ramírez *et al.*, 2024[40]).

4.3.2 Link to Site Network Coherence

4.3.2.1 The UK guillemot population is estimated at 1,265,888 breeding individuals (Burnell *et al.*, 2023[5]), this population was 12.9% of the world population during the Seabird 2000 census (1998-2002) (JNCC, 2021[6]). The majority of the UK population (56%) is located in Scotland with 810,645 individuals recorded in the Seabirds Count (2015-2021). The Scottish population estimate represents a decline of approximately 31% since the Seabird 2000 count of 1,172,957 individuals (1998-2002) (Burnell *et al.*, 2023[5]). Key breeding colonies are found in the Handa islands, Shetland and Orkney as well as along the East coast (Mitchell *et al.*, 2004[4]).

4.3.2.2 Guillemot have a mean maximum foraging range of 73.2±80.5km or 55.5±39.7 km (Woodward *et al.,* 2019[34]). The second foraging range excludes the Fair Isle due to reduced prey availability during the study year (Woodward *et al.*, 2019[34]).

4.3.2.3 Table 3-1 shows the conservation objectives for the designated bird features at each protected site of concern. Impacts from the Proposed Development (Offshore) have the potential to undermine those listed conservation objectives of SPAs where guillemot is a qualifying feature, with energetic impacts (displacement effects) potentially reducing the ability of the network to support a viable guillemot population (i.e., impacting site network coherence).

4.3.2.4 For each SPA site for which the RIAA concluded a potential for AEoSI for guillemot, population counts and the proportion of UK population hosted at the site (based on Seabirds Count 2015-21 data, Burnell *et al.* 2023[5]) are shown here to further clarify the importance of each site to the network:

- East Caithness Cliffs SPA:
  - Population size: 149,228 individuals
  - Proportion of UK population: 11.8%

4.4 Puffin

4.4.1 Species Overview

4.4.1.1 Puffin are colonial birds which nest in burrows during the breeding season (April-mid August) (NatureScot, 2020[15]). Puffin diet primarily consists of *Ammodytidae*, *Clupeidae* and *Gadidae*, with sandeel representing a high proportion of their diet (Miles *et al.*, 2015[45]).

4.4.1.2 A wide range of factors have been shown to affect puffin. A study on populations with contrasting population trends found that declining populations have greater foraging ranges and a more diverse, less energy-dense diet, indicating that prey availability is affecting productivity and population trends. (Fayet *et al.*, 2021[46]). Mammalian predation of puffin by predators such as American Mink (*Neovison vison*) and rats (*Rattus norvegicus*, *Rattus rattus*) inhibits the growth of the population, with the removal of predators allowing recolonisation and breeding numbers to increase at eradicated colonies (Booker *et al.*, 2018[47], Stoneman and Zonfrillo, 2005[48], Zonfrillo, 2001[49]). Furthermore, avian predation from gulls *Laridae* spp. and great skua (*Stercorarius skua*) has been recorded as a pressure faced by puffin, for example on the Fair Isles and Firth Forth (Miles *et al.*, 2015[45], Finney *et al.*, 2001[50], Lopez *et al.*, 2023[51]). Puffin are currently thought to have only suffered low mortality as a result of HPAI, however estimates for burrow-nesters such as puffin are flagged to have low accuracy (Tremlett *et al.*, 2024[28])

4.4.2 Link to Site Network Coherence

4.4.2.1 The UK puffin population comprises of 474,679 apparently occupied burrows (AOB) (Burnell *et al.*, 2023[5]), this population was 9.6% of the world's population during the Seabird 2000 census (1998-2002) (JNCC, 2021[6]). The majority of the population (75%) is located within Scotland (369,279 AOB) according to the Seabirds Count (2015-2021) (Burnell *et al.*, 2023[5]). Puffin colonies are distributed across the coast of Scotland, with primary concentrations in the north-east and the Northern Isles (Mitchell *et al.*, 2004[4]).

4.4.2.2 Table 3-1 shows the conservation objectives for the designated bird features at each protected site of concern. Impacts from the Proposed Development have the potential to undermine those listed conservation objectives of SPAs where puffin is a qualifying feature, with energetic impacts (displacement effects) potentially reducing the ability of the network to support a viable puffin population (i.e., impacting site network coherence).

4.4.2.3 For each SPA site for which the RIAA concluded a potential for AEoSI for puffin, population counts and the proportion of UK population hosted at the site (based on Seabirds Count 2015-21 data, Burnell *et al.* 2023[5]) are shown here to further clarify the importance of each site to the network:

- Sule Skerry and Sule Stack SPA:
  - Population size: 47,742 AOB
  - Proportion of UK population: 10.1%

5 Long List and Feasibility Assessment

5.1 Introduction

5.1.1.1 This section provides a description of all longlisted compensation options, with a brief description of the ecological relevance of the measure for the species of concern, and any other key considerations to note. The full feasibility assessment, based on the criteria described in Section 2.5, is shown in Table 7-1.

5.2 Sandeel Fishery Closure

5.2.1 Overview

5.2.1.1 Closure of sandeel fisheries near SPAs and/or at key foraging grounds, creating a fisheries exclusion zone. This measure aims to boost the local prey availability. The increase in available prey has the potential to boost productivity and survival for seabirds which have sandeel as prey, leading to an increase in population size and improved population resilience.

5.2.1.2 It should be noted that industrial sandeel fishing was banned in the English North Sea and all Scottish Waters by the English and Scottish governments respectively in March 2024. The EU have since triggered a dispute mechanism looking for the ban to be lifted, though at the time of writing the ban remains upheld. The future of sandeel fisheries closures at a national level, and therefore the potential to deliver this as a compensation measure locally, is presently unclear. Whilst facilitating a sandeel fishery closure in itself is unlikely to be a feasible compensation option, compensation could instead consist of wider support of the closure, for example through the funding of monitoring and research.

5.2.2 Kittiwake

5.2.2.1 On the Isle of May breeding productivity increased with the proportion of sandeel in the chick diet, with the composition of the chicks diet linked to sandeel abundance and fishing effort (Searle *et al.*, 2023[52]).

5.2.2.2 The annual return rate for breeding kittiwake and the population size of the Isle of May colony is positively correlated with sandeel stock biomass (McGregor, 2022b[53]). Similarly in Shetland adult survival rates are also related to the sandeel abundance (Oro and Furness, 2002[54]).

5.2.2.3 In summary, there is strong evidence that sandeel fishery closures would be of benefit to breeding kittiwake populations.

5.2.3 Gannet

5.2.3.1 Gannet are able to exploit a wide range of fish species and ranges of sizes from sandeel to mackerel (Hamer *et al.*, 2000[35]), thus are unlikely to be affected as strongly by sandeel prey availability when compared to species which are more dependent on them. Sandeel fishery closure has not been identified as a potentially suitable measure in previous reviews of compensation options for this species (Furness *et al.*, 2013[9]; Furness, 2021[11]).

5.2.4 Guillemot

5.2.4.1 On the Isle of May there was no evidence of a positive effect of a 20-year East Scotland sandeel fishery closure on guillemot productivity (Searle *et al.*, 2023[52]). However, shifts in sandeel phenology and declines in sandeel abundance after the closure period may have masked any benefits of the closure, and it is possible that declines would have been more marked without the closure. Guillemot productivity rate was linked to the increase in the proportion of sandeels within the chick's diet, with diet composition related to sandeel abundance (Searle *et al.*, 2023[52]).

5.2.4.2 Forage fish are considered a key determinant of guillemot breeding productivity although evidence suggests they are more capable of switching to non-sandeel prey (sprats) than some other seabird species (Furness, 2021[11]).

5.2.5 Puffin

5.2.5.1 On the Isle of May there was no evidence of a positive effect of the East Scotland sandeel fishery closure on puffin productivity (Searle *et al.*, 2023[52]), with no evidence to suggest that productivity on the Isle of May increases with the proportion of sandeel in the chick diet (Searle *et al.*, 2023[52]). However, shifts in sandeel phenology and declines in sandeel abundance after the closure period may have masked any benefits of the closure, and it is possible that declines would have been more marked without the closure.

5.2.5.2 More widely, food availability is known to be a key factor for puffin populations, with the decline in the breeding puffin population on Fair Isle over a 27-year period associated with reduced quantities of fish captured by breeding adults (Miles *et al.*, 2015[45]), and evidence that overwinter survival in puffins may be linked to availability of forage fish, with sandeels identified as an important winter prey on the Isle of May (St. John Glew *et al.*, 2019[55]).

5.3 Other Fisheries Management (Closure/No Take Zones)

5.3.1 Overview

5.3.1.1 This measure involves the closure of other fisheries near SPAs or key foraging sites, creating a fisheries exclusion zone. This management option has the potential to increase prey availability (as well as having the potential to reduce seabird bycatch in fishing gear), thereby looking to support both breeding success and adult survival of seabird species.

5.3.2 Kittiwake

5.3.2.1 There is limited evidence of effects of fisheries management on kittiwake productivity in Scotland.

5.3.2.2 Sprat can be an important breeding season prey item at some UK east coast colonies (including small colonies in the upper Firth of Forth), so benefits at such colonies may arise by establishing sprat no-take zones (Furness, 2021[11]). However, since sandeel is the key prey species for kittiwake, it is anticipated that restrictions on other types of fishing may have reduced benefits.

5.3.3 Gannet

5.3.3.1 There is no direct evidence of benefits of fisheries management on gannet in Scotland.

5.3.3.2 Rates of increase in gannet breeding numbers showed no apparent decline during period when herring and mackerel stocks in UK waters were depleted (1960s – 1980s) (Furness *et al.*, 2013[9]).

5.3.4 Guillemot

5.3.4.1 There is no direct evidence of benefits of fisheries management on guillemot in Scotland.

5.3.4.2 Sprat is the main fishery other than sandeel previously identified as potentially important to guillemot, with such fisheries considered to be currently limited to localised activity off west coast of Scotland and English Channel (Furness *et al.*, 2013[9]).

5.3.5 Puffin

5.3.5.1 There is no direct evidence of benefits of fisheries management on puffin.

5.3.5.2 In Shetland, puffin appear to be a sandeel specialist to a greater degree than guillemot (Furness, 2021[11]). This may mean that there is less potential benefit from management of other fisheries for puffin than for other seabird species.

5.4 Mammalian Predator Management and Eradication

5.4.1 Overview

5.4.1.1 This measure would involve lethal or non-lethal predator control measure at a breeding colony to reduce nest predation and increase breeding success.

5.4.1.2 Predation by invasive non-native mammals is considered a key threat to breeding seabird island colonies (Brooke *et al.*, 2018[56]). Mammals such as brown and black rats, feral cats (*Felis catus*) and *Mustelidae* such as American mink are all known to predate seabird eggs, chicks and adults (Latorre *et al.*, 2013[57]; Craik, 1997[58]; Ratcliffe *et al.*, 2010[59]).

5.4.1.3 Therefore, the removal of these mammalian predators, in particular from island colonies, could potentially result in a reduction of predation on eggs and chicks, thus increasing both productivity and the population size.

5.4.2 Kittiwake

5.4.2.1 It is considered likely that many kittiwake colonies are inaccessible to most mammalian predators, since they are predominantly found on cliffs (Furness, 2021[11]).

5.4.2.2 There is limited evidence of mammalian predation affecting nesting kittiwakes, but there is evidence that breeding productivity (in some years at least) was considered to be reduced due to predation by brown rats and cats at colonies on the Isles of Scilly, by mink at St Abb's Head and by foxes at Lowestoft (Furness *et al.*, 2013[9]).

5.4.2.3 The beneficial effects of this compensatory measure may be restricted to specific situations, for examples at particular sites where nest spaces are thought to be accessible to mammalian predators.

5.4.3 Gannet

5.4.3.1 Most reviews of potential compensation measures currently provide little evidence that mammalian predation is a substantial problem at UK gannet colonies (Furness *et al.*, 2013[9]; Furness, 2021[11]; McGregor *et al.*, 2022a[12]).

However, an earlier review undertaken by Coulson (2002[60]) reported that rats have been observed predating on gannet eggs and chick.

5.4.4 Guillemot

5.4.4.1 Studies showed that rat eradication resulted in greatly increased breeding numbers on Lundy Island, but not on other sites such as Canna (Furness, 2021[11]). The increase on Lundy was due to colonisation of previously unoccupied habitat where nests would have been vulnerable to predation (Furness, 2021[11]), showing substantial benefit from mammalian predator control/eradication through opening up additional nesting space, with resulting benefits for productivity.

5.4.4.2 Rat eradication programmes have been agreed as a viable compensatory measure for Hornsea Four OWF (DESNZ, 2023[61]). The measure has also been proposed on Handa Island as compensation for Berwick Bank OWF, but evidence on potential effectiveness is currently considered weak at that specific location (Skeate, 2022[62]).

5.4.5 Puffin

5.4.5.1 Rat eradication from offshore islands can benefit breeding puffin populations, with eradication from Lundy Island, Handa and Canna resulting in increases in breeding puffin populations (Booker *et al.*, 2019[63]; Luxmoore *et al.*, 2019[64]). Furthermore, puffins recolonised Ailsa Craig following rat eradication (Zonfrillo, 2001[49]).

5.5 Avian Predator Control

5.5.1 Overview

5.5.1.1 This measure would involve the exclusion of avian predators such as large gull species from a buffer zone around a breeding colony to reduce breeding failure due to predation.

5.5.1.2 The management of avian predators could be achieved through human disturbance (e.g., wardens acting as “scarers”), non-lethal control or culling. This measure has the potential to reduce predation, which can lead to a higher productivity rate and population increase for target species. As the avian predator species may also be of conservation concern, any avian predator control measure would need to carefully consider any conflicting conservation priorities between the target species and predator species. This potential conflict may make this measure difficult to realise in practice at many sites.

5.5.2 Kittiwake

5.5.2.1 There is evidence of great skua predation affecting adult survival rates and being associated with colony declines in the Northern Isles (Anderson, 1976[65]; Votier *et al.*, 2008[66]). Any such effects may be limited to Northern Isles and possibly other parts of north and north-west Scotland, and great skua HPAI mortality might have reduced predation impacts on seabirds in recent years, although no research findings are currently available.

5.5.2.2 Larger gull species may also predate kittiwake eggs and chicks (as recorded at the Farne Islands and Ailsa Craig), and great skuas and peregrine falcons have been recorded predating large chicks or fledglings at a small number of colonies (Furness *et al.*, 2013[9]).

5.5.2.3 Technical feasibility for this measure for kittiwake needs to consider the potential for smaller gull species such as kittiwake to respond any deterrents implemented for large gull predators. Any measures which affect kittiwake also, would make this measure infeasible for kittiwake.

5.5.3 Gannet

5.5.3.1 There is no significant evidence to suggest avian predation of this species.

5.5.4 Guillemot

5.5.4.1 Predation of eggs by ravens, crows, gulls and skuas is considered to be widespread, and nestlings and some fledglings are taken by large gulls and skuas (Furness, 2021[11]).

5.5.5 Puffin

5.5.5.1 Puffins are subject to predation by great skuas (Votier *et al.,* 2004[66]). The reduction of herring gull (*Larus argentatus*) and lesser black-backed gull (*Larus fuscus fuscus*) nests was linked to an increase recruitment rate of puffins to the breeding colony on the Isle of May (Finney *et al.*, 2003[67]). Furthermore, puffins breeding in gull-free habitat on the Isle of May provisioned their chicks at a higher rate, with lower risk to kleptoparasitism, compared to those in gull-occupied habitats (Finney *et al.*, 2001[50]).

5.6 Establish New Colonies at Suitable Natural Sites

5.6.1 Overview

5.6.1.1 This measure would involve the establishment of new colonies at site(s) that are not currently occupied. These new colonies would be on natural substrates, but could include sites modified by humans, e.g., human-made cliff ledges. This measure could increase breeding numbers, improve access to resources, reduce density dependent productivity or reduce predator pressure.

5.6.2 Kittiwake

5.6.2.1 No known evidence for benefit for this in the UK (but note there is widespread evidence on kittiwake nesting on artificial nesting sites, which has been the go-to nest site creation option for this species, see section 5.7.2).

5.6.3 Gannet

5.6.3.1 Australian gannet (*Morus serrator*) has been attracted to new natural site through the use of social attractants (Sawyer and Fogle, 2013[68]). However, there is only limited research into northern gannet, with no evidence of successful attempts (Furness *et al.*, 2013[9]).

5.6.4 Guillemot

5.6.4.1 Parker *et al.* (2007[69]) demonstrated that through the use of decoys, mirrors and social attractants, guillemots recolonised natural nesting sites at Devil's Slide Rock, California in 1996. Surveys undertaken as part of the artificial nesting structure suitability surveys for Hornsea Four OWF included the occurrence of ~100 guillemots on a single platform, with potential breeding behaviours observed, showing the ability of guillemot to colonise new sites (Ørsted, 2021[44], Ørsted, 2022[70]).

5.6.5 Puffin

5.6.5.1 Evidence of limited, early, success in using decoys along with sound recordings to attract breeding puffins to recolonise the Calf of Man following rat eradication, and to achieve first known colonisation of the Copeland Islands in Northern Ireland (Manx National Heritage, 2021[71]).

5.7 Provision of Artificial Nesting Structures (ANS)

5.7.1 Overview

5.7.1.1 This measure involves the construction of a nesting structure at an onshore or offshore location with the aim to provide additional breeding spaces.

5.7.1.2 These would be established near feeding grounds to increase foraging success and reduce the energetic constraints on breeding adults, which can potentially improve survival rate of adults, and thus productivity. Moreover, ANS can be designed in order to provide shelter from predation and environmental conditions (which may be exacerbated with climate change).

5.7.2 Kittiwake

5.7.2.1 Benefits of additional coastal / onshore nest sites seem unlikely in east Scotland given natural nest sites are abundant and populations have declined.

5.7.2.2 Kittiwakes are known to use artificial nesting structures and have been documented as colonising structures at various locations away from existing colonies, including offshore oil platforms (Furness, 2021[11], Ørsted, 2021[44]). Purpose-built structures in Gateshead are being readily used by breeding pairs (Ørsted, 2022[70]). No evidence appears to be available on colonisation of offshore structures in waters off the east coast of Scotland, where kittiwake populations have undergone marked declines and where nesting sites are unlikely to be limited.

5.7.2.3 As this measure has strong effectiveness evidence elsewhere, and is feasible financially and logistically, this measure could be revisited at a later date if deemed appropriate by consultees. An investigation of colony-specific population trends may be worthwhile to identify any sites where trends are different to the national pattern (i.e., have grown and plateaued), to see whether this measure may be feasible at select sites in Scotland.

5.7.3 Gannet

5.7.3.1 No published record of northern gannet nesting on artificial structures has been identified, although there are some records of breeding attempts on manmade structures associated with harbours, such as boat decks and tarpaulin-covered boats (Giagnoni *et al.* 2015[72]). There is also historical evidence of gannet in the Mediterranean breeding on jetties, boats and floating docks (Giagnoni *et al.* 2015[72]).

5.7.4 Guillemot

5.7.4.1 Surveys undertaken as part of the artificial nesting structure suitability surveys for Hornsea Four OWF identified auk species present on offshore infrastructure, which included the occurrence of ~100 guillemots on a single platform and observations of potential breeding behaviours (Ørsted, 2021[44], Ørsted, 2022[70]). There is also evidence of guillemot nesting on ledges on a purpose-built cliff-side building in Sweden (Hentati-Sundberg *et al.* 2012[73]). There is therefore potential for this measure to be suitable for auks though further evidence gathering would be required to provide greater confidence.

5.7.5 Puffin

5.7.5.1 Artificial burrows were being trialled on Jersey in 2020, but no further information on the outcome was available at this stage (Birds on the Edge, 2020[74]). Further investigations may be worthwhile if other compensation options are deemed infeasible.

5.8 Reduction of Disturbance at Colonies

5.8.1 Overview

5.8.1.1 This measure would involve site management aiming to reduce the anthropogenic disturbance of breeding seabirds, which in turn can increase productivity at the colony. The management implemented can include, but is not limited to the following:

- the employment of wardens to guide visitor behaviour and raise awareness of disturbance;
- the installation of visitor signage with information on ways to reduce disturbance; and
- funding the design of alternative trails to avoid sensitive/breeding areas.

5.8.2 Kittiwake

5.8.2.1 Human disturbance had a negative effect on the nesting success of the St Abbs Head kittiwake population (Beale and Monaghan, 2004[33]). The study also highlights the potential benefits of disturbance-reducing measures, concluding that negative impacts on nesting success due to a 10% increase in visitor numbers can be prevented by moving the viewpoints from which visitors observe kittiwake nests an additional 3.9m away (Beale and Monaghan, 2004[33]).

5.8.3 Gannet

5.8.3.1 Allbrook and Quinn (2020[38]) indicated that at the Great Saltee SPA in Ireland, breeding gannet are disturbed by visitors to the island. Group size, the total number of visitors and the proximity of approach relative to breeding locations all had an impact on the level of disturbance to the breeding gannet. Introduced signage substantially reduced the visitors' proximity to the birds (Allbrook and Quinn, 2020[38]).

5.8.3.2 Visitor disturbance is thought to increase chick mortality at the Bass Rock colony (approximately 40 chicks per year), although the number of landings and thus amount of disturbance varies annually(DTA, 2020[10]).

5.8.4 Guillemot

5.8.4.1 There is evidence of human disturbance having a negative effect on the nesting success of guillemot, for example at St Abbs Head (Beale and Monaghan, 2004[33]). The study found that when visitor numbers are increased by 10%, moving visitors a further 1.3m away from guillemot nests would result in no net effects on nesting success, highlighting the potential benefit of disturbance-reducing measures (Beale and Monaghan, 2004[33]).

5.8.5 Puffin

5.8.5.1 There is evidence that puffin can be disturbed by humans at the colony, with impacts on breeding success reported (Rodway *et al.*, 1996[75]).

5.9 Reduction of Disturbance at Sea

5.9.1 Overview

5.9.1.1 This measure would involve funding engagement with e.g., water sports industry to raise awareness on seabird disturbance from vessels and water sport activities such as boating, jet skiing, kayaking and paddleboarding. This could lead to reduction in disturbance and displacement and thus reduce mortality and increase productivity.

5.9.2 Kittiwake

5.9.2.1 There is deemed to be little evidence that this species is particularly susceptible to vessel traffic or other sources of anthropogenic disturbance at sea (Royal HaskoningDHV, 2024[8]).

5.9.3 Gannet

5.9.3.1 There is little evidence that this species is particularly susceptible to vessel traffic or other sources of anthropogenic disturbance at sea (Royal HaskoningDHV, 2024[8]).

5.9.4 Guillemot

5.9.4.1 This species has been assessed as moderately sensitive to vessel traffic or other sources of anthropogenic disturbance at sea (Royal HaskoningDHV, 2024[8]), likely particularly during breeding and moult periods. There is anecdotal evidence of watersports causing disturbance to guillemot colonies (Torbay Coat and Countryside Trust, 2024[76]).

5.9.5 Puffin

5.9.5.1 Whilst Royal HaskoningDHV, 2024 *et al.*concludes that there is little evidence that this species is particularly sensitive to vessel traffic or other sources of anthropogenic disturbance at sea, there is anecdotal evidence of disturbance of puffin by watercraft when the birds are rafting on the water (Alderney Wildlife Trust, 2024[77]).

5.10 Bycatch Mitigation

5.10.1 Overview

5.10.1.1 This measure involves the monitoring of bycatch, implementation of best practice for commercial fishing vessels, and/or the trialling or use of bird-scaring devices attached to fishing gear to reduce seabird bycatch with the aim of increasing survival and adult population size.

5.10.1.2 Northridge *et al.* (2020[39]) and Miles *et al.* (2020[78]) undertook an analysis of the UK Bycatch Monitoring Programme data, identifying areas of concern around the UK and contributed to closing knowledge gaps. Within the UK, static net (set gillnet) fisheries were deemed an important fishery with regards to guillemot, razorbill and gannet bycatch, and longline fisheries as an important fishery with regards to gannet bycatch. However, the coverage of the UK BMP is limited, with <1% of static net, 1-2% of longline, and roughly 5% of midwater trawl fishing effort being monitored. There is an existing UK research base with established methods for monitoring bycatch. Monitoring of bycatch, through electronic monitoring or on-board observers, would be thus a technically feasible way to further close knowledge gaps on gannet bycatch

5.10.1.3 In addition, a review was undertaken by the JNCC, on behalf of Defra, of the current seabird bycatch reduction techniques implemented in fisheries worldwide that are likely to be effective in reducing seabird bycatch by UK fleets (Anderson *et al.*, 2022[79]). According to Anderson *et al.* (2022[79]), several effective seabird bycatch reduction techniques for demersal long-line fisheries could be applied to UK fleets, highlighting the feasibility of bycatch mitigation trials.

5.10.1.4 The Applicant is currently carrying out a pilot study on bycatch in the greater Moray Firth area; for further information see Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection.

5.10.2 Kittiwake

5.10.2.1 There is some evidence of kittiwake being bycaught in UK waters, and Bradbury *et al.*, (2017[29]) listed kittiwake in the top 50% of seabird species sensitive to bycatch in surface gear, indicating some sensitivity to being bycaught. Whilst bycatch is recorded for this species, it is unlikely to be a substantial problem, with Northridge *et al.* (2020[39]) estimating UK annual bycatch to be in the region of tens of birds per year.

5.10.3 Gannet

5.10.3.1 Gannet are highly sensitive to entrapment and mortality from surface fishing gear (Bradbury *et al.*, 2017[29]). Bycatch has been attributed to gannet population decline in areas including the Rouzic colony in Brittany, France

(Grémillet *et al.*, 2020[80]). Bycatch is considered a well-established threat to gannet populations, especially long-line fisheries, with hundreds estimated to be caught in UK waters each year (Northridge *et al.*, 2020[39]). Bycatch in UK waters may occur year-round (with an increase in juveniles taken in the summer) and coincides with the main wintering areas for the UK breeding population.

5.10.4 Guillemot

5.10.4.1 Guillemot have been identified to be within the top 10% of the seabird species most sensitive to bycatch by surface fishing gears (Bradbury *et al.*, 2017[29]). According to Northridge *et al*. (2020[39]), guillemot are vulnerable to coastal and offshore static net fisheries. Around the UK between 1,800 to 3,300 guillemots are estimated to be bycaught each year (Northridge *et al.*, 2020[39]).

5.10.5 Puffin

5.10.5.1 Bycatch reduction has not been identified as a potential measure in previous reviews of options for compensation, as there is little indication that puffin may be at risk of bycatch mortality (Furness *et al.*, 2013[9], Furness, 2021[11]).

5.11 Reduction/Cessation of Illegal Harvesting of Eggs, Chicks and/or Adult Birds

5.11.1.1 This measure was included in the Royal HaskoningDHV (2024[8]) long list of regional compensation measures. It would involve work with stakeholders to end licensed bird harvesting, i.e., Sula Sgeir gannet chick harvest and end harvest of adult puffins on the Faroe Island. Removal of the licence would decrease mortality, thus likely increasing the breeding bird population at the colony and overall site network. However, due to the cultural and heritage aspects of harvesting, this measure will not be considered as a feasible compensation option for the project (as concluded in Royal HaskoningDHV (2024[8]) as a regional measure also).

5.12 Supplementary Feeding

5.12.1 Overview

5.12.1.1 This measure involves the provision of supplementary food near breeding colonies during the breeding season. This measure has the potential to decrease competition, increase breeding productivity and reduce mortality in adult birds.

5.12.2 Kittiwake

5.12.2.1 Provisioning of food to breeding kittiwakes and chicks at Middleton Island, Alaska demonstrated positive effects on breeding productivity (Gill *et al.*, 2002[81]), but implementation is unlikely to be practical as a sustainable and appropriate compensation measure.

5.12.3 Gannet

5.12.3.1 No known evidence for effects. Likely that supplementary feeding would benefit breeding performance in conditions of low prey availability but unlikely to be practical.

5.12.4 Guillemot

5.12.4.1 No known evidence for effects. Likely that supplementary feeding would benefit breeding performance in conditions of low prey availability but unlikely to be practical.

5.12.5 Puffin

5.12.5.1 Supplementary feeding of puffin chicks on St Kilda led to faster growth rates of chicks and / or heavier fledging weights than unfed controls (Harris, 1978[82]). In other cases, provisioning of the chicks by the parent birds has declined in response to supplementary feeding, resulting in little difference in growth rates fed and unfed groups (Cook and Hamer, 1997[83]). Such differences appear to reflect stronger effects of supplementary feeding in conditions of low forage fish abundance.

5.13 Restoration or Maintenance of Breeding Sites

5.13.1 Overview

5.13.1.1 This measure would involve the restoration or maintenance of existing nesting sites through removal of vegetation (invasive and non-invasive) to create a suitable habitat for seabirds, which can improve breeding population densities and nest success.

5.13.2 Kittiwake

5.13.2.1 It is unlikely that the management of supporting habitats would bring sufficient benefits to represent a feasible compensation measure, given that the vast majority of breeding kittiwakes are cliff nesting.

5.13.3 Gannet

5.13.3.1 No examples were identified where specific habitat management is required at UK gannet colonies in the UK.

5.13.4 Guillemot

5.13.4.1 It is unlikely that the management of supporting habitats would bring sufficient benefits to represent a feasible compensation measure, given that the vast majority of breeding guillemot are cliff nesting. Therefore, whilst unlikely to be scalable to an appropriate standalone measure, breeding site measures could be considered as a supporting measure to provide additional compensation.

5.13.5 Puffin

5.13.5.1 Access to puffin nesting burrows can be affected by growth of tall, dense, vegetation. For example, invasive tree mallow has colonised several islands in the Forth Islands SPA (e.g., Craigleith, Fidra, The Lamb), resulting in substantive declines in numbers of breeding puffin. Removal of tree mallow on Craigleith has been associated with recovery in the breeding puffin population at this location (Van Der Wal *et al.*, 2008[84], Anderson, 2021[85]).

5.14 Seagrass Restoration

5.14.1 Overview

5.14.1.1 This measure would provide additional seagrass habitats to increase areas of shelter and nursery habitat for fish populations, which in turn can increase fish biomass and availability of prey species (Apostoloumi et al., 202186). This can improve foraging success of birds, increasing both survival and productivity for seabird species. Other benefits are an increase in carbon capture which can contribute to the reduction of climate change impacts.

5.14.2 All Key Species

5.14.2.1 This measure would benefit all key species as important prey fish species will be supported by this habitat. Therefore, the effectiveness of this measure will be assessed for all key species combined.

5.14.2.2 The extension of seagrass habitat is likely to increase the availability of nursery habitats for seabird prey species, given how individual fish species utilise seagrass and known seabird diets (Ørsted, 2021[44]).

5.14.2.3 Whilst there are clear broad environmental benefits of seagrass restoration, quantifying the benefits for seabird populations would be challenging.

5.15 Oyster Reef Restoration

5.15.1 Overview

5.15.1.1 This measure would include the restoration of oyster reefs located in the UK with the aim of improving seabird prey availability, which in turn would improve foraging success of birds, increasing both survival and productivity for seabirds.

5.15.2 All Key Species

5.15.2.1 This measure would benefit all key species as important prey fish species will be supported by this habitat. Therefore, the effectiveness of this measure will be assessed for all key species combined.

5.15.2.2 Oysters are reef builders, creating habitat complexity that provides shelter, nesting habitat, and nursery grounds for juvenile fish (Preston *et al.*, 2020[87]), which has the potential to increase prey abundance for seabirds.

5.15.2.3 No direct evidence was found to suggest that restoring oyster reefs can quantifiably benefit seabird populations in the UK.

5.16 Kelp Bed Extension

5.16.1 Overview

5.16.1.1 This measure would include the extension of kelp beds located in the UK with the aim to improve prey availability, which in turn would improve foraging success of seabirds, increasing both their survival and productivity .

5.16.2 All Key Species

5.16.2.1 This measure would benefit all key species as important prey species will be supported by this habitat. Therefore, the effectiveness of this measure will be assessed for all key species combined.

5.16.2.2 Kelp beds serve as a nursery grounds and protection to commercial fish species (Teagle *et al.*, 2017[88]). In the Beagle Channel, Argentina, kelp beds were associated with higher seabird abundance, attributed to high prey species diversity (Raya Rey and Schiavini, 2000[89]).

5.16.2.3 There is no current evidence from the UK that quantifiably links kelp bed creation to seabird population benefits.

5.17 Reduction of Anthropogenic Pollution from Agricultural Runoff or Discharge from Waste Treatment Facilities

5.17.1 Overview

5.17.1.1 This measure facilitates improvements in the management of agricultural runoff or waste treatment discharge into the ocean through research, advice and outreach with waste treatment facilities. A reduction in the number of and magnitude of pollution events could bring widespread benefits for seabirds and likely reduce mortality. This is of particular relevance in the context of the locality of Caledonia OWF, given the fact that Aberdeenshire, Banff and Buchan are designated nationally as a Nitrate Vulnerable Zone[90].

5.17.2 All Key Species

5.17.2.1 This measure works by aiming to reduce the potential for harmful algal toxins to bioaccumulate in lower trophic level species such as fish, which are subsequently preyed on by seabirds (Gibble and Hoover, 2018[91]). Increased contaminant concentrations, caused by harmful algal toxins, within seabirds are likely to affect overall fitness and may lead to reduction in reproductive success or increase mortality rates (Smith *et al.*, 1999[92]).

5.17.2.2 Increased primary productivity and algal blooms can limit the capacity of seabird feathers to be waterproof, negatively affecting foraging efficiency and increasing potential for mortality (Phillips *et al.*, 2011[93]).

5.17.2.3 There is however no current evidence from the UK that quantifiably links such pollution to seabird population benefits. Therefore, whilst there are clear environmental benefits to be gained from this measure, evidencing compensation delivery, in terms of quantified benefits to seabirds, would be infeasible.

5.18 Marine Litter Removal

5.18.1 Overview

5.18.1.1 This measure would consist of the removal of plastic waste at SPA and key non-SPA sites to reduce mortality from entanglement. Furthermore, the removal of plastics could reduce negative effects of plastic ingestion and the trophic transfer of plastics from prey species to seabirds (Wang *et al.,* 2021[94]).

5.18.2 Kittiwake

5.18.2.1 In a study 311 kittiwake nests at the Bulbjerg colony in 2005 plastic waste was recorded in 57.2% of nests (Hartwig *et al.*, 2007[30]). There are several citizen science reports of entanglement being caused by fishing lines and plastic debris incorporated into nests (Birds and debris, 2023[95]). Furthermore, 15% of kittiwake were found to have ingested plastic in the Arctic *(*Baak *et al.*, 2020[96]).

5.18.3 Gannet

5.18.3.1 The Grassholm (Wales) gannet colony contained 18.46 tonnes of plastic waste based on surveys of a small sample of nests in 2006, consisting of primarily of synthetic rope, with plastic debris responsible for entangling 525 individuals in eight years (65 birds a year on average, mostly consisting of juvenile birds) (Votier *et al.*, 2011[97]). Since the level of plastic pollution has likely increased in the decades since this study was carried out, it seems likely that equivalent numbers of birds impacted today could be even greater. Gannet are frequently recorded in the 'citizen science' reports of birds entangled in marine debris in the UK (Birds and debris, 2023[95]).

5.18.4 Guillemot and Puffin

5.18.4.1 Entanglement in discarded materials appears to be relatively rare in auks based on the lack of reports in the literature, although entanglement in active fishing gear especially drift nets is more often reported (see Section 5.10).

5.19 Biosecurity

5.19.1 Overview

5.19.1.1 This measure would be to prevent invasive species from recolonising island colonies that have previously been cleared. The measure is generally used as part of mammalian eradication or control programmes for island colonies, but could potentially be delivered as a standalone compensation measure, for instance through the creation of a fund to be used to extend biosecurity of existing completion of eradication or control programmes.

5.19.2 All Key Species

5.19.2.1 Although mammalian predation is predominantly a threat for auks (see Section 5.4), gannet and kittiwake could also be potentially affected if predators have access to their nesting habitats.

5.19.2.2 Biosecurity is considered to be the most cost-effective strategy for island management (Holmes *et al.*, 2023[98]). An existing example of a key project which successfully implemented biosecurity in the UK (as part of a wider eradication/control programme) is "Biosecurity for LIFE", which aims to protect seabird from invasive predators by producing biosecurity plans for all SPA islands that are designated for breeding birds in the UK (Biosecurity for LIFE, 2024[99]). Plans include quarantine or prevention measures, surveillance procedures and incursion response plans (Thomas and Varnham, 2021[100]).

5.20 Feasibility Assessment

5.20.1.1 Table 7-1 presents the full feasibility assessment for the longlisted compensation options presented above.

6 Shortlisted Measures

6.1 Refined Compensation List

6.1.1.1 Following a review of feasibility of delivery of each measure and in the light of the outcomes of the apportioning, in-combination assessments and PVA, the list of compensatory measures taken forward was refined into a species-specific short list. A brief overview of the key feasibility considerations for shortlisting, based on the information presented in Table 7-1 is provided for each of the shortlisted measures (by species) below. The shortlisted compensatory measures were taken forward for further development and presented in the Ornithological Compensation Plan (Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection), which contains detail on ecological effectiveness, feasibility, site selection, wider ecological considerations, timing of delivery, monitoring requirements and adaptive management requirements.

6.1.1.2 The shortlisted measures are also taken forward to discuss, progress and refine with stakeholders as a part of the Applicant's ornithological compensation consultation and Implementation and Monitoring Plan development process. The outline IMP can be found in Application Document 16, Appendix 16-4: Caledonia South Outline Implementation and Monitoring Plan.

6.1.1.3 It is envisaged that site selection and further research and refinement of the compensation options will lead to the identification of a smaller suite of compensation measures that will be progressed as the compensation case for the Proposed Development. Therefore, the shortlisted options presented here do not represent a final list of proposed measures, but rather a short list based on which further selection, refinement and development will take place.

6.1.1.4 Should additional potential measures be identified as part of a future site selection process or other research activity, such a measure may be included in the compensation case despite not being presented in the short list here.

6.2 Kittiwake

6.2.1 Overview

6.2.1.1 Based on the assessment of feasibility in Table 7-1, presented below is the short list of potential measures deemed suitable to be taken forward for next steps for compensation development:

- Reduction of disturbance at colonies
- Mammalian predator management and eradication; and
- Non-lethal avian predator control.

6.2.2 Reduction of Disturbance at Colonies

6.2.2.1 Kittiwake populations are declining in Scotland (Burnell *et al.*, 2023[5]), with reports of this species being influenced by recreational activity (see Section 5.8.2). There is thus ecological evidence that at least certain populations of kittiwake are impacted by the threat of human disturbance which the measure looks to address. Reduction measures that can be implemented include for example the introduction of wardens, signage and path diversions (Allbrook and Quinn, 2020[38]), all measures which are technically highly feasible to implement. Further site selection work is needed to identify suitable colonies for implementation (see Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection for site selection information). There are likely little to no legal constraints for implementation of this measure. Monitoring the reduction in activities that could result in disturbance is possible; however, linking this directly with improvements in productivity is likely more challenging, and as such, a semi-quantitative or qualitative estimate of productivity benefits is likely most feasible.

6.2.3 Mammalian Predator Management and Eradication

6.2.3.1 There is ecological evidence that mammalian predators influence kittiwake populations (see Section 5.4.2) at specific colonies; this threat is site-specific and dependent on specific situations such as the accessibility of nesting sites to predators. Predator management is technically feasible; it has been successful in Scotland and beyond (see Section 5.4). The development of a control program is financially and legally feasible, but the funding of an existing eradication programme would be more efficient both financially and logistically, as existing community/stakeholder support, governance, licensing and associated logistics are already in place. Monitoring the success of measures is also highly feasible, as monitoring guidelines for both predator and seabird populations are available.

6.2.4 Non-lethal Avian Predator Control

6.2.4.1 Avian predation on kittiwake eggs and chicks is evident around the Northern Isles and the north-west of Scotland (see Section 5.5.2), showing that there is ecological evidence that kittiwake are impacted by the threat this measure looks to address. The primary feasibility issue is with lethal measures, since this could negatively impact another bird species of conservation concern or SPA qualifying species (e.g., gull species). For that reason, the Applicant is considering non-lethal avian predator control measures only. There is evidence to suggest that non-lethal avian predator control can be successful through the implementation of various non-lethal methods (wardens, scarecrows, auditory measure) to deter avian predators, thus showing the technical feasibility of this measure. In addition, predation prevention may be achieved through the recovery and at-sea release of fledglings which have not yet left the colony and are thus susceptible to predation (as carried out for puffin at the Isle of May (The Scotsman, 2021[101]). Effective methods of control will need to be evaluated and designed, considering the potential for smaller gull species such as kittiwake to respond any deterrents implemented for large gull predators; any techniques which affect kittiwake also would be infeasible.

6.3 Gannet

6.3.1 Overview

6.3.1.1 Based on the assessment of feasibility in Table 7-1, presented below is the short list of potential measures deemed suitable to be taken forward for next steps for compensation development:

- Reduction of disturbance at colony;
- Bycatch mitigation; and
- Mammalian predator management and eradication.

6.3.2 Reduction of Disturbance at Colony

6.3.2.1 Gannet are highly sensitive to human disturbance at SPAs across the UK (see Section 5.8.3), showing there is ecological evidence for the threat that this compensation measures looks to address. This measure is highly feasible from a technical, legal and financial perspective; measures could be implemented collaboratively between The Applicant and site managers and/or landowners, or strategic funding can be provided to sites where disturbance is an impact at a site and where management plans are in place but have limited funding or resources to implement successful measures. There are likely little to no legal constraints. Reduction measures that can be implemented include for example the introduction of wardens, signage and path diversions, all straightforward from a technical feasibility perspective.

6.3.3 Bycatch Mitigation

6.3.3.1 Gannet are vulnerable to bycatch due a proportion of their diets consisting of fishery discards, with long-line methods posing the greatest threat for bycatch (see Section 5.10.3). There is thus ecological evidence that this species is faced by the threat that this compensation measure seeks to address. There is ongoing research into methods to reduce bycatch (see Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection), illustrating that there is some evidence for the technical feasibility for bycatch mitigation measures, however the success of these technologies has research gap that could be addressed as part of the implementation of this measure. This compensation measures would be better suited to deployment as a collaborative approach with other developers, for example providing funding into research for potential mitigation measures. There are unlikely to be legal constraints.

6.3.3.2 Further action would need to be taken to assess the potential scale of bycatch within the northern North Sea and would require desk-based research along with fisheries consultation. The Applicant is carrying out a pilot study in collaboration with fishing vessels in the greater Moray Firth area between April and October 2024 to assess the feasibility of data collection on bycatch in the area, as well as to collect information on the types of interaction observed between vessels and seabird species. Vessels using a range of methods (e.g., static, scallops, trawl/nephrops) have been included within the pilot study. The findings of the study will be used to assist in the planning of extended monitoring in future years. The Applicant is well placed to undertake collaborative work with the fishing industry due to its longstanding relationships with the industry in the Moray Firth region.

6.3.4 Mammalian Predator Management and Eradication

6.3.4.1 There is some limited ecological evidence that mammalian predators affect UK breeding gannet (see Section 5.4.3). Predation pressures are likely dependent on specific situations such as the accessibility of nesting sites to predators, therefore, this measure is retained as a potential compensation option to allow site selection to explore potential predation issues at specific colonies. Predator management has been successful in Scotland (see Section 5.4), with Biosecurity for LIFE reducing the risk of incursion across 38 islands (Biosecurity for LIFE, 2024[99]), highlighting the high technical feasibility of this measure. The development of a control program is financially and legally feasible, but the funding of an existing eradication programme would be more efficient both financially and logistically, as existing community/stakeholder support, governance, licensing and associated logistics are already in place.

6.4 Guillemot

6.4.1 Overview

6.4.1.1 Based on the assessment of feasibility in Table 7-1, presented below is the short list of potential measures deemed suitable to be taken forward for next steps for compensation development:

- Reduction of disturbance at colonies;
- Mammalian predator management and eradication;
- Non-lethal avian predator control; and
- Bycatch mitigation.

6.4.2 Reduction of Disturbance at Colonies

6.4.2.1 There is evidence of guillemot being negatively affected by recreational activity in Scotland (see Section 5.8.4), providing ecological evidence that this species is affected by the disturbance threat that this measure seeks to address. This measure is technically straightforward and thus feasible to implement; it could be implemented collaboratively between The Applicant and site managers and/or landowners, or strategic funding could be provided to sites where disturbance is an impact at a site and where management plans are in place but have limited funding. There are little to no legal constraints. Reduction measures that can be implemented include for example the introduction of wardens, signage and path diversions.

6.4.3 Mammalian Predator Management and Eradication

6.4.3.1 There is evidence of eradication programmes increasing the breeding number of guillemot (see Sections 5.4.4), thus providing ecological evidence for the effectiveness of this measure. Effectiveness could be dependent on specific situations such as the accessibility of nesting sites to predators. Predator management has been successful in Scotland (see Section 5.4), highlighting the technical feasibility of this measure. The development of a control program is financially and legally feasible, but the funding of an existing eradication programme would be more efficient both financially and logistically, as existing community/stakeholder support, governance, licensing and associated logistics are already in place.

6.4.4 Non-lethal Avian Predator Control

6.4.4.1 Avian predation of guillemot eggs is considered widespread in the UK (see Sections 5.5.4), providing ecological evidence for the threat that this compensation measure looks to address. The primary feasibility issue is with lethal measures, since this could negatively impact a species of conservation concern or SPA qualifying species. For that reason, the Applicant is considering non-lethal avian predator control measures only. There is evidence to suggest that non-lethal avian predator control can be successful through the implementation of various non-lethal methods (wardens, scarecrows, auditory measure) this measure is thus deemed technically feasible. In addition, predation prevention may be achieved through the recovery and at-sea release of fledglings which have not yet left the colony and are thus susceptible to predation (as carried out for puffin at the Isle of May[101]). The cost of this measure will be dependent on the location and scale of the measure and this measure may require a licence, but is generally considered financially and legally feasible.

6.4.5 Bycatch Mitigation

6.4.5.1 Guillemot are part of the top 10% of the most sensitive seabird to bycatch within the UK (see Sections 5.10.4), thus there is ecological evidence that this species faces the threat that this measure looks to address. There is ongoing research into methods to reduce bycatch (see Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection) and a range of methods have been trialled, thus showing the technical feasibility of this measure. However, further research into the success of these technologies is desirable as part of the implementation of this measure to fill current knowledge gaps. This measure could thus take the form of providing (funding into) research for potential bycatch mitigation measures, and if sufficiently successful measures are deemed to be available, funding of the uptake of such measures by the fishing industry. This measure is financially feasible, but would likely be better suited as a collaborative measure with other developers (to be delivered more effectively and deliver greater results). There are unlikely to be legal constraints. Quantifying compensation gains from a research-only program would be potentially challenging, but this would depend on the scale of implementation. Further action would need to be taken to assess the potential scale of bycatch within the northern North Sea, and would require desk-based research along with fisheries consultation.

6.5 Puffin

6.5.1 Overview

6.5.1.1 Based on the assessment of feasibility in Table 7-1, presented below is the short list of potential measures deemed suitable to be taken forward for next steps for compensation development:

- Reduction of disturbance at colonies;
- Mammalian predator management and eradication;
- Non-lethal avian predator control; and
- Management of supporting habitats at colony.

6.5.2 Reduction of Disturbance at Colonies

6.5.2.1 There is some evidence of this species being negatively affected by recreational activity (see Section 5.8.5), thus providing ecological evidence for the disturbance threat that this compensation measure seeks to address. There is existing research into disturbance reduction measures, which are generally straightforward to design and implement; this compensation measure is thus deemed technically highly feasible. Reduction measures that can be implemented include for example the introduction of wardens, signage and path diversions. The implementation of such disturbance reduction measures is considered financially feasible. Strategic funding could also be provided to sites where disturbance is an impact at a site and where management plans are in place but have limited funding or resource. There are likely little to no legal constraints.

6.5.3 Mammalian Predator Management and Eradication

6.5.3.1 There is evidence of eradication programmes benefiting puffin (see Section 5.4.5), thus providing ecological evidence for the effectiveness of this measure. The effectiveness could be dependent on specific situations such as the accessibility of nesting sites to predators. Predator management has been successful in Scotland (see Section 5.4); this measure is thus deemed technically highly feasible. The development of a control program is financially feasible, but the funding of an existing eradication programme would be more efficient both financially and logistically, as existing community/stakeholder support, governance, licensing and associated logistics are already in place.

6.5.4 Non-lethal Avian Predator Control

6.5.4.1 Avian predation of puffin (by gulls and great skua) was evident in the Isle of May (see Section 5.5.5), thus providing ecological evidence that puffin face the avian predator threat that this compensation measure seeks to reduce. The primary feasibility issue is with lethal measures, since this could negatively impact a species of conservation concern or SPA qualifying species. For that reason, the Applicant is considering non-lethal avian predator control measures only. There is evidence to suggest that non-lethal avian predator control can be successful for some seabird colonies, through the implementation of various non-lethal methods (wardens, scarecrows, auditory measure). This measure is thus deemed technically feasible. In addition, predation prevention may be achieved through the recovery and at-sea release of fledglings which have not yet left the colony and are thus susceptible to predation (as carried out for puffin at the Isle of May[101]). This measure is deemed financially and legally feasible; the exact cost of this measure will be dependent on the location and scale of the measure and this measure may require a licence.

6.5.5 Restoration or Maintenance of Breeding Sites

6.5.5.1 The removal of vegetation that restricts the access to nesting burrows has allowed the recovery of puffin populations in the Forth Islands (see Section 5.13.5); there is thus ecological evidence for the effectiveness of this measure. Existing guidelines for habitat restoration and vegetation removal are available; this measure is thus deemed technically feasible. This measure is deemed financially feasible to implement by the developer in collaboration with site managers, or alternatively funding can be provided for projects that have limited resources or to employ contractors for clearance. It is unlikely that there would be any legal constraints.

6.6 Conservation Management Funding

6.6.1.1 Following consultation with NatureScot in July 2024, an additional compensatory approach which Caledonia OWF has included in the short list is the funding of site management activities (e.g., those outlined in management plans or proposed elsewhere) that have not been realised or have been discontinued/scaled back, for example due to limited funds and/or resource.

6.6.1.2 This does not represent a distinct compensation measure (as of yet) and is thus not outlined in the feasibility assessment above; the option of funding management could include the funding (and/or other forms of support) of a variety of site conservation and management activities including, but not limited to, disturbance reduction, litter removal, predator management or vegetation clearance. The opportunity and scope for such funding will be investigated as part of a site-selection assessment for potential compensatory measures which will be carried out as part of the "next steps" of the compensation development. Methodology and preliminary findings of site selection are presented in Application Document 16, Appendix 16-3: Caledonia South Compensation Plan and Site Selection.

6.6.1.3 With regards to the concept of "additionality", it is important to note that European Commission guidance states that, in order to ensure the overall coherence of the network, compensatory measures should be 'additional' to the actions which are normal practice under the Habitats and Birds Directives.

6.6.1.4 The Applicant's understanding is that in situations where a measure or activity is listed in management plans or other proposals, but is unlikely to be commenced in the near future (or has been discontinued without plans to re-commence), a measure/activity could thus be considered outside the normal practice for the site, and thus considered "additional" by NatureScot for the purposes of compensation delivery.

6.6.1.5 The Applicant will look to identify sites (or proposed locations) where management options have been discontinued or cancelled, and will look to consult with site managers and other stakeholders to identify any opportunities where funding could ensure these management activities are (re-)commenced.

7 Compensation Long List

7.1.1.1 The long list of potential compensation measures considered for the Proposed Development (Offshore) is provided in Table 7-1.

Table 7-1: Initial long list and feasibility assessment of compensation measures for the key species for the Proposed Development (Offshore), with measures shown in blue rows taken forward to short list.

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
Sandeel fishery closure	Kittiwake	Cannot be implemented by developer alone; needs to be led by the Scottish and UK Governments, but developers could provide funds to deliver policy change, and/or monitoring and research.	Highly feasible to provide financial incentive to deliver the monitoring and research required to evaluate the success of the measure, and/or (further) policy change.	The stricter regulation of the fisheries is regulated by the UK Government. This measure is not feasible for the developer alone but as proven by the recent ban for UK-based fisheries it is legally feasible.	Time is required for response and recovery in sandeel population. If main benefits to seabird species are via increased productivity, there is a time delay between implementation and response in adult breeding numbers at SPA colonies (age of recruitment is four years).	Strong ecological evidence that this species could potentially benefit	Monitoring changes in sandeel populations and seabird survival, productivity and populations is highly feasible. Quantifying benefit (i.e., changes in seabirds attributable to fishery ban) is challenging due to many potential confounding factors.	Recent sandeel fishery closure in Scottish and English waters means this measure will occur irrespective of OWF compensation. Other forms of support (e.g., funding of monitoring/research could be considered). Could bring significant wider marine biodiversity benefits.
Sandeel fishery closure	Gannet	Cannot be implemented by developer alone; needs to be led by the Scottish and UK Governments, but developers could provide funds to deliver policy change, and/or monitoring and research.	Highly feasible to provide financial incentive to deliver the monitoring and research required to evaluate the success of the measure, and/or (further) policy change.	The stricter regulation of the fisheries is regulated by the UK Government. This measure is not feasible for the developer alone but as proven by the recent ban for UK-based fisheries it is legally feasible.	Time is required for response and recovery in sandeel population. If main benefits to seabird species are via increased productivity, there is a time delay between implementation and response in adult breeding numbers at SPA colonies (age of recruitment is five years).	Weak ecological evidence that this species could potentially benefit	Monitoring changes in sandeel populations and seabird survival, productivity and populations is highly feasible. Quantifying benefit (i.e., changes in seabirds attributable to fishery ban) is challenging due to many potential confounding factors.	Recent sandeel fishery ban in Scottish and English waters means this measure will occur irrespective of OWF compensation. Other forms of support (e.g., funding of monitoring/ research could be considered). Could bring significant wider marine biodiversity benefits.
Sandeel fishery closure	Guillemot	Cannot be implemented by developer alone; needs to be led by the Scottish and UK Governments, but developers could provide funds to deliver policy change, and/or monitoring and research.	Highly feasible to provide financial incentive to deliver the monitoring and research required to evaluate the success of the measure, and/or (further) policy change.	The stricter regulation of the fisheries is regulated by the UK Government. This measure is not feasible for the developer alone but as proven by the recent ban for UK-based fisheries it is legally feasible.	Time is required for response and recovery in sandeel population. If main benefits to seabird species are via increased productivity, there is a time delay between implementation and response in adult breeding numbers at SPA colonies (age of recruitment is six years).	Moderate ecological evidence that this species could potentially benefit	Monitoring changes in sandeel populations and seabird survival, productivity and populations is highly feasible. Quantifying benefit (i.e., changes in seabirds attributable to fishery ban) is challenging due to many potential confounding factors.	Recent sandeel fishery ban in Scottish and English waters means this measure will occur irrespective of OWF compensation. Other forms of support (e.g., funding of monitoring/ research could be considered). Could bring significant wider marine biodiversity benefits.
Sandeel fishery closure	Puffin	Cannot be implemented by developer alone; needs to be led by the Scottish and UK Governments, but developers could provide funds to deliver policy change, and/or monitoring and research.	Highly feasible to provide financial incentive to deliver the monitoring and research required to evaluate the success of the measure, and/or (further) policy change.	The stricter regulation of the fisheries isregulated by the UK Government. This measure is not feasible for the developer alone but as proven by the recent ban for UK-based fisheries it is legally feasible.	Time is required for response and recovery in sandeel population. If main benefits to seabird species are via increased productivity, there is a time delay between implementation and response in adult breeding numbers at SPA colonies (age of recruitment is five years).	Moderate ecological evidence that this species could potentially benefit	Monitoring changes in sandeel populations and seabird survival, productivity and populations is highly feasible. Quantifying benefit (i.e., changes in seabirds attributable to fishery ban) is challenging due to many potential confounding factors.	Recent sandeel fishery ban in Scottish and English waters means this measure will occur irrespective of OWF compensation. Other forms of support (e.g., funding of monitoring/ research could be considered). Could bring significant wider marine biodiversity benefits.
Other fisheries management (closure/ no take zones)	Kittiwake, Gannet, Guillemot, Puffin	Fishery bans and no take zones within the UK need to be implemented by Government, thus not technically feasible for a	Highly feasible to provide financial incentive to deliver policy change and/or the monitoring and research required to evaluate the success of the measure.	Closures/no-take zones (e.g., through MPA designation) of an MPA would need to be implemented by UK Government (rather than	Time is required for response and recovery in fish populations. If main benefits to seabird species are via increased productivity, there is a time delay between	Currently, ecological evidence of benefit to these species in Scotland is weak.	Monitoring changes in fish populations and seabird survival, productivity and populations is highly feasible. Quantifying benefit (i.e., changes in	This measure would need to be led by the UK Government, therefore developer would not control the date of implementation. Could bring significant wider marine biodiversity

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
		private developer to implement.		developer-led) but legally feasible.	implementation and response in adult breeding numbers at SPA colonies (4–6 years from implementation depending on species).		seabirds attributable to fishery ban) is challenging due to many potential confounding factors.	benefits. Could be implemented as a collaborative measure with other developers and stakeholders.
Mammalian predator control	Kittiwake	Mammalian predator eradication is highly feasible on isolated (predominantly island) locations. There are established methodologies, guidelines and specialists, making this measure technically highly feasible. Whilst implementable by developer alone, measure would be well-suited as a collaborative measure with other developers providing funding into monitoring bycatch and trialling mitigation measures.	Deemed financially feasible for delivery by developer; exact cost would be dependent on the location and scale of control, methods and their success. High financial feasibility for funding an existing eradication program (expansion, extension and/or biosecurity).	Legally feasible, as illustrated by numerous eradication programmes across UK. Licences would be required for lethal control. Access to sites would need to be agreed and adhered to. This measure would target invasive species, so no issues should arise in relation to EIA or HRA.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As predation mostly concerns eggs and chicks, there will be a delay between implementation and response in adult breeding numbers (age of recruitment is four years).	There is some ecological evidence to suggest that kittiwake suffer mammalian predation at certain sites.	Monitoring of both predator numbers and seabird breeding site/ colony pre and post eradication is feasible, and monitoring guidelines are available from e.g., past eradication programmes.	Biosecurity measures are essential to prevent reinvasion. Effects of control measure on non-target species should be considered. Through Biosecurity for Life, SPA colonies with predation have already been identified and secured for eradication and biosecurity. Potential for negative public perception.
Mammalian predator control	Gannet	Mammalian predator eradication is highly feasible on isolated (predominantly island) locations. There are established methodologies, guidelines and specialists, making this measure technically highly feasible. Whilst implementable by developer alone, measure would be well-suited as a collaborative measure with other developers providing funding into monitoring bycatch and trialling mitigation measures.	Deemed financially feasible for delivery by developer; exact cost would be dependent on the location and scale of control, methods and their success. High financial feasibility for funding an existing eradication program (expansion, extension and/or biosecurity).	Legally feasible, as illustrated by numerous eradication programmes across UK. Licences would be required for lethal control. Access to sites would need to be agreed and adhered to. This measure would target invasive species, so no issues should arise in relation to EIA or HRA.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As predation mostly concerns eggs and chicks, there will be a delay between implementation and response in adult breeding numbers (age of recruitment is five years).	There is limited evidence that gannet suffer mammalian predation.	Monitoring of both predator numbers and seabird breeding site/ colony pre and post eradication is feasible, and monitoring guidelines are available from e.g., past eradication programmes.	Biosecurity measures are essential to prevent reinvasion. Effects of control measure on non-target species should be considered. Through Biosecurity for Life, SPA colonies with predation have already been identified and secured for eradication and biosecurity. Potential for negative public perception.
Mammalian predator control	Guillemot, Puffin	Mammalian predator eradication is highly feasible on isolated (predominantly island) locations. There are established methodologies, guidelines and specialists, making this measure technically highly feasible.	Deemed financially feasible for delivery by developer; exact cost would be dependent on the location and scale of control, methods and their success. High financial feasibility for funding an existing eradication program	Legally feasible, as illustrated by numerous eradication programmes across UK. Licences would be required for lethal control. Access to sites would need to be agreed and adhered to. This measure would target invasive species,	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As predation mostly concerns eggs and chicks, there will be a delay between implementation and response in adult breeding numbers (5–6	Eradication of invasive mammalian predators has previously been proven to lead to increase in breeding colonies of guillemot and puffin, and as such it is likely that these species could	Monitoring of both predator numbers and seabird breeding site/ colony pre and post eradication is feasible, and monitoring guidelines are available from e.g., past eradication programmes.	Biosecurity measures are essential to prevent reinvasion. Effects of control measure on non-target species should be considered. Through Biosecurity for Life, SPA colonies with predation have already been identified and secured for eradication and biosecurity. Potential

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
		Whilst implementable by developer alone, measure would be well-suited as a collaborative measure with other developers providing funding into monitoring bycatch and trialling mitigation measures.	(expansion, extension and/or biosecurity).	so no issues should arise in relation to EIA or HRA.	years from implementation depending on species).	benefit from this measure.		for negative public perception.
Avian predator control	Kittiwake	Only non-lethal avian predator control is being considered. There is moderate evidence on the effectiveness of using (e.g., wardens or other deterrents to reduce incidences of predation).	This measure is deemed financially feasible for a developer to deliver. Exact cost would be dependent on the location and scale of control, methods and their success.	Licence could be required. Measure may impact predator species of conservation concern or an SPA-qualifying species and could lead to EIA and HRA adverse effect.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As predation mostly concerns eggs and chicks, there will be a delay between implementation and response in adult breeding numbers (age of recruitment is four years).	Some evidence to suggest that avian predator control could reduce chick and adult mortality.	Monitoring of populations pre- and post- control is highly feasible. Monitoring of incidences of predation, and/or response of avian predators to deterrent measures (incl. habituation effects) is feasible but likely requires extensive monitoring. Attributing population changes to predation rate changes may be challenging due to confounding factors, as such (semi-) qualitative approach likely needed.	Effective methods of control to be identified. Predation may be only by specific individuals from large colonies. This measure could negatively impact a predatory species of conservation concern or SPA qualifying species. Scale of compensation that is deliverable is uncertain, as is longevity of measure at a given site (habituation effects).
Avian predator control	Gannet	Only non-lethal avian predator control is being considered. There is moderate evidence on the effectiveness of using (e.g., wardens or other deterrents to reduce incidences of predation).	This measure is deemed financially feasible for a developer to deliver. Exact cost would be dependent on the location and scale of control, methods and their success.	Licence could be required. Measure may impact predator species of conservation concern or an SPA-qualifying species and could lead to EIA and HRA adverse effect.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As predation mostly concerns eggs and chicks, there will be a delay between implementation and response in adult breeding numbers (age of recruitment is five years).	There is a lack of evidence to suggest this measure is effective for this species.	Monitoring of populations pre- and post- control is highly feasible. Monitoring of incidences of predation, and/or response of avian predators to deterrent measures (incl. habituation effects) is feasible but likely requires extensive monitoring. Attributing population changes to predation rate changes may be challenging due to confounding factors, as such (semi-) qualitative approach likely needed.	Effective methods of control to be identified.
Avian predator control	Guillemot, Puffin	Only non-lethal avian predator control is being considered. There is moderate evidence on the effectiveness of using (e.g., wardens or other deterrents to reduce incidences of predation).	This measure is deemed financially feasible for a developer to deliver. Exact cost would be dependent on the location and scale of control, methods and their success.	Licence could be required. Measure may impact predator species of conservation concern or an SPA-qualifying species and could lead to EIA and HRA adverse effect.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As predation mostly concerns eggs and chicks, there will be a delay between implementation and response in adult breeding numbers (5–6	Some evidence to suggest that avian predator control could reduce chick and adult mortality.	Monitoring of populations pre- and post- control is highly feasible. Monitoring of incidences of predation, and/or response of avian predators to deterrent measures (incl. habituation effects) is feasible but likely requires extensive monitoring. Attributing	Predation may be only by specific individuals from large colonies.

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
					years from implementation depending on species).		population changes to predation rate changes may be challenging due to confounding factors, as such (semi-) qualitative approach likely needed.	
Establish new colonies at suitable natural sites	Kittiwake	There is a limited evidence to suggest this measure is technically feasible for these species. There is relevant research into attraction techniques (decoys, playbacks etc), and protocols for re-establishing populations of other species have been developed.	This measure would be financially feasible for a developer to deliver.	It is unlikely that any land acquisition would be required, however an agreement may be required prior to installation. Deemed legally feasible.	Time would be needed to further develop approach due to limited technical feasibility information currently. It would take four years for fledged juveniles from the newly established colony to reach breeding age, thus there will be a delay between implementation and an effect on breeding population size.	No known evidence in UK.	Monitoring a new breeding site for breeding activity is highly feasible, with clearly established seabird monitoring protocols available.	Sites where nest site availability is limited need to be identified – measure only relevant where nest space is limiting factor for population.
Establish new colonies at suitable natural sites	Gannet	There is a limited evidence to suggest this measure is technically feasible for these species. There is relevant research into attraction techniques (decoys, playbacks etc), and protocols for re-establishing populations of other species have been developed.	This measure would be financially feasible for a developer to deliver.	It is unlikely that any land acquisition would be required, however an agreement may be required prior to installation. Deemed legally feasible.	Time would be needed to further develop approach due to limited technical feasibility information currently. It would take five years for fledged juveniles from the newly established colony to reach breeding age, thus there will be a delay between implementation and an effect on breeding population size.	Some ecological evidence to suggest gannet can colonise new sites.	Monitoring a new breeding site for breeding activity is highly feasible, with clearly established seabird monitoring protocols available.	Sites where nest site availability is limited need to be identified – measure only relevant where nest space is limiting factor for population.
Establish new colonies at suitable natural sites	Guillemot	There is a limited evidence to suggest this measure is technically feasible for these species. There is relevant research into attraction techniques (decoys, playbacks etc), and protocols for re-establishing populations of other species have been developed.	This measure would be financially feasible for a developer to deliver.	It is unlikely that any land acquisition would be required, however an agreement may be required prior to installation. Deemed legally feasible.	Time would be needed to further develop approach due to limited technical feasibility information currently. It would take six years for fledged juveniles from the newly established colony to reach breeding age, thus there will be a delay between implementation and an effect on breeding population size.	No known evidence in UK, some international examples of new sites.	Monitoring a new breeding site for breeding activity is highly feasible, with clearly established seabird monitoring protocols available.	Sites where nest site availability is limited need to be identified – measure only relevant where nest space is limiting factor for population.
Establish new colonies at suitable natural sites	Puffin	There is a limited evidence to suggest this measure is technically feasible for these species. There is relevant research into attraction techniques (decoys, playbacks etc), and protocols for re-establishing populations of other species have been developed.	This measure would be financially feasible for a developer to deliver.	It is unlikely that any land acquisition would be required, however an agreement may be required prior to installation. Deemed legally feasible.	Time would be needed to further develop approach due to limited technical feasibility information currently. It would take five years for fledged juveniles from the newly established colony to reach breeding age, thus there will be a delay between implementation and an	Some UK evidence gannet can colonise new sites.	Monitoring a new breeding site for breeding activity is highly feasible, with clearly established seabird monitoring protocols available.	Sites where nest site availability is limited need to be identified – measure only relevant where nest space is limiting factor for population.

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
					effect on breeding population size.			
Provision of artificial nesting structures	Kittiwake	Colonisation of ANS is known for this species. Information on optimal design and attraction techniques available.	This measure would be financially feasible. Onshore structures are less costly than offshore.	If sited onshore, it is unlikely that any land acquisition would be required, however an agreement is likely to be required prior to installation. For an offshore structure a marine licence application or acquisition of a pre-existing structure is likely to be required, which may require additional impact assessment.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. Colonisation of an artificial structure can take multiple years. Following colonisation, it will then take a further four years for any fledged to reach breeding age.	Strong evidence of feasibility, successful artificial nesting in numerous UK locations.	Annual monitoring is required, with productivity and population census. Monitoring any attraction methods incorporated into the design, effectiveness of these techniques which can inform future ANS designs.	Benefits of additional onshore nest sites may be unlikely in Scotland given that natural nest sites are abundant and populations have declined. Further study would be needed to identify floating population.
Provision of artificial nesting structures	Gannet, Guillemot	Limited knowledge of optimial design of artificial structures for nesting.	This measure would be financially feasible. Onshore structures are less costly than offshore.	If sited onshore, it is unlikely that any land acquisition would be required, however an agreement is likely to be required prior to installation. For an offshore structure a marine licence application or acquisition of a pre-existing structure is likely to be required, which may require additional impact assessment.	Time would be needed to further develop approach due to limited technical feasibility information currently. Colonisation of an artificial structure can take multiple years. Following colonisation, it will then take a further 5-6 years for any fledged to reach breeding age.	Some evidence of nesting on artificial structures (offshore platforms).	Annual monitoring is required, with productivity and population census. Monitoring any attraction methods incorporated into the design, effectiveness of these techniques which can inform future ANS designs.	Only feasible in locations where there is a nest site shortage and floater population. High costs and logistical difficulties of constructing / maintaining structures if offshore.
Provision of artificial nesting structures	Puffin	Artificial burrows have been trialled at other sites, so designs/ approaches available.	This measure would be financially feasible. Onshore structures are less costly than offshore.	If sited onshore, it is unlikely that any land acquisition would be required, however an agreement is likely to be required prior to installation. For an offshore structure a marine licence application or acquisition of a pre-existing structure is likely to be required, which may require additional impact assessment.	Could be implemented and providing benefits rapidly as artificial burrows have been trialled, thus information on which to base technical approach available. Colonisation of an artificial structure can take multiple years. Following colonisation, it will then take a further five years for any fledged to reach breeding age.	Limited ecological evidence of breeding in artificial burrows.	Annual monitoring is required, with productivity and population census. Monitoring any attraction methods incorporated into the design, effectiveness of these techniques which can inform future ANS designs.	Only feasible in locations where there is a nest site shortage and floater population. High costs and logistical difficulties of constructing / maintaining structures if offshore.
Reduction of disturbance at colonies	Kittiwake, Gannet, Guillemot	Technically highly feasible as established methods for disturbance reduction available (e.g., path diversions, signage, wardens).	Financially feasible and straightforward. Can be achieved through directly funding contractors/ wardens.	Liaise with landowner to get agreement/ collaborate to implement the measures.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As this measure targets an increase in productivity, there will be a delay between implementation and response in adult breeding numbers (4–6 years from	There is evidence that disturbance impacts breeding success, ecologically feasible for this measure to increase productivity.	At a minimum, baseline surveys of seabird productivity pre- and post- implementation of the measure would need to be undertaken. Implemented changes should be quantified where possible (e.g., distance between humans and nests pre- and post-implementation). Changes in disturbance	Potentially difficult / complicated to demonstrate and quantify disturbance eoccurances and impacts. May conflict with basic requirements of public access and value of wildlife watching, and potential for negative financial effects from reduced tourism (only if measures impact visitor numbers). At SPAs, likely considered as part of management, so potentially

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
					implementation depending on species).		should also be quantified wherever possible (e.g., flushing events, nest attendance time).	only suitable at non-SPA sites to meet additionality requirements.
Reduction of disturbance at colonies	Puffin	Technically highly feasible as established methods for disturbance reduction available (e.g., path diversions, signage, wardens).	Financially feasible and straightforward. Can be achieved through directly funding contractors/ wardens.	Liaise with landowner to get agreement/ collaborate to implement the measures.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As this measure targets an increase in productivity, there will be a delay between implementation and response in adult breeding numbers (age of recruitment is five years).	Limited ecological evidence, however, there may be specific sites/circumstances where human disturbance can affect colonies.	At a minimum, baseline surveys of seabird productivity pre- and post- implementation of the measure would need to be undertaken. Implemented changes should be quantified where possible (e.g., distance between humans and nests pre- and post- implementation). Changes in disturbance should also be quantified wherever possible (e.g., flushing events, nest attendance time).	Potentially difficult / complicated to demonstrate and quantify disturbance eoccurances and impacts. May conflict with basic requirements of public access and value of wildlife watching, and potential for negative financial effects from reduced tourism (only if measures impact visitor numbers). At SPAs, likely considered as part of management, so potentially only suitable at non-SPA sites to meet additionality requirements.
Bycatch mitigation	Kittiwake	Bycatch mitigation is an active field of research, with a range of mitigation techniques available to either implement or trial.	Feasible, but likely costly due to the level of monitoring required pre- and post-implementation of bycatch reduction technologies, particularly due to the sporadic nature of bycatch events. Whilst implementable by developer alone, measure would be well-suited as a collaborative measure with other developers providing funding into monitoring bycatch and trialling mitigation measures.	There are unlikely to be any legal constraints to providing funding into research, conducting monitoring on vessels, or providing fisheries with bycatch technology for implementation.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As adults (as well as juveniles) are prevented from being bycaught, there is no lead-in time for this measure, in contrast to measures which address productivity. There is however time required for programme design and fishery engagement (minimum of one to two years).	Whilst kittiwake are bycaught, it is only estimated to be in low numbers. Therefore, whilst feasible, highly unlikely to bring substantial benefits.	Highly feasible to monitor (although large monitoring programme required due to sporadic nature of bycatch events and large number of potential confounding factors). Established protocols for monitoring bycatch on vessels, as well as electronic monitoring options, are available.	Further study needed into the scale of potential benefits achievable if implemented in Scotland. By-catch issues well-studied in other European waters, but connectivity with UK or Scottish breeding populations may be needed to evidence effectiveness of this measure for ensuring network coherence.
Bycatch mitigation	Gannet, Guillemot	Bycatch mitigation is an active field of research, with a range of mitigation techniques available to either implement or trial.	Feasible, but likely costly due to the level of monitoring required pre- and post-implementation of bycatch reduction technologies, particularly due to the sporadic nature of bycatch events. Whilst implementable by developer alone, measure would be well-suited as a collaborative measure with other developers providing funding into monitoring bycatch and trialling mitigation measures.	There are unlikely to be any legal constraints to providing funding into research, conducting monitoring on vessels, or providing fisheries with bycatch technology for implementation.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As adults (as well as juveniles) are prevented from being bycaught, there is no lead-in time for this measure, in contrast to measures which address productivity. There is however time required for programme design and fishery engagement, likely short/medium term (minimum of one to two years).	These species are known to be highly susceptible to being bycaught, as such this measure is ecologically highly feasible.	Highly feasible to monitor (although large monitoring programme required due to sporadic nature of bycatch events and large number of potential confounding factors). Established protocols for monitoring bycatch on vessels, as well as electronic monitoring options, are available.	Further study needed into the scale of potential benefits achievable if implemented in Scotland. By-catch issues well-studied in other European waters, but connectivity with UK or Scottish breeding populations may be needed to evidence effectiveness of this measure for ensuring network coherence.

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
Bycatch mitigation	Puffin	Bycatch mitigation is an active field of research, with a range of mitigation techniques available to either implement or trial.	Feasible, but likely costly due to the level of monitoring required pre- and post-implementation of bycatch reduction technologies, particularly due to the sporadic nature of bycatch events. Whilst implementable by developer alone, measure would be well-suited as a collaborative measure with other developers providing funding into monitoring bycatch and trialling mitigation measures.	There are unlikely to be any legal constraints to providing funding into research, conducting monitoring on vessels, or providing fisheries with bycatch technology for implementation.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As adults (as well as juveniles) are prevented from being bycaught, there is no lead-in time for this measure, in contrast to measures which address productivity. There is however time required for programme design and fishery engagement, likely short/medium term (minimum of one to two years).	There is weak ecological evidence to suggest that this species would potentially benefit from the implementation of this measure.	Highly feasible to monitor (although large monitoring programme required due to sporadic nature of bycatch events and large number of potential confounding factors). Established protocols for monitoring bycatch on vessels, as well as electronic monitoring options, are available.	Further study needed into the scale of potential benefits achievable if implemented in Scotland. By-catch issues well-studied in other European waters, but connectivity with UK or Scottish breeding populations may be needed to evidence effectiveness of this measure for ensuring network coherence.
Reduction or cessation of illegal harvesting of eggs	Measure not considered further due to cultural constraints.							
Supplementary feeding	Kittiwake	Whilst technically feasible to provide supplementary food in theory, unlikely to be practical in practice (see other feasibility columns).	Likely costly, particularly long-term with ongoing feeding required to sustain any positive effects. Cost is dependent on the mechanism and the extent of feeding.	Likely to be feasible legally, although access restrictions and conflicts with existing management plans at sites need to be considered. If habitat modification is needed to install a feed station, then this could impact other features of the SPA.	Can be rapidly implemented and providing benefits as there is existing methodologies for artificial feeding of bird populations that could be replicated. If measure leads to increased survival of adults there is no lead-in time before benefits of the measure are delivered. If supplementary feeding leads to increased productivity only, increase in productivity, there will be a delay between implementation and response in adult breeding numbers (age of recruitment is four years).	There is moderate ecological evidence to suggest that this species would potentially benefit from the implementation of this measure.	Whilst productivity and population changes can be readily monitored, and if experimental set-up (control site and supplementary feeding site) is used likely beneficial effects could be demonstrated.	Risk of attracting competitors and potential predatory species (e.g., large gulls), as well as vermin/scavengers. For supplementary feeding, requirement for accessible colonies and/or development of a method for successfully delivering supplementary food to the colony. Supplementary feeding unlikely to be practical since puffin burrows are often inaccessible and disturbance when feeding is likely to detrimentally affect breeding success.
Supplementary feeding	Gannet, Guillemot	Whilst technically feasible to provide supplementary food in theory, unlikely to be practical in practice (see other feasibility columns).	Likely costly, particularly long-term with ongoing feeding required to sustain any positive effects. Cost is dependent on the mechanism and the extent of feeding.	Likely to be feasible legally, although access restrictions and conflicts with existing management plans at sites need to be considered. If habitat modification is needed to install a feed station, then this could impact other features of the SPA.	Can be rapidly implemented and providing benefits as there is existing methodologies for artificial feeding of bird populations that could be replicated. If measure leads to increased survival of adults there is no lead-in time before benefits of the measure are delivered. If supplementary feeding leads to increased productivity only, increase in productivity, there will be a delay between implementation and response in adult breeding numbers (4-6 years).	There is no ecological evidence to suggest that these species would potentially benefit from the implementation of this measure.	Whilst productivity and population changes can be readily monitored, and if experimental set-up (control site and supplementary feeding site) is used likely beneficial effects could be demonstrated.	Risk of attracting competitors and potential predatory species (e.g., large gulls), as well as vermin/scavengers. For supplementary feeding, requirement for accessible colonies and/or development of a method for successfully delivering supplementary food to the colony. Supplementary feeding unlikely to be practical since puffin burrows are often inaccessible and disturbance when feeding is

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
								likely to detrimentally affect breeding success.
Supplementary feeding	Puffin	Whilst technically feasible to provide supplementary food in theory, unlikely to be practical in practice (see other feasibility columns).	Likely costly, particularly long-term with ongoing feeding required to sustain any positive effects. Cost is dependent on the mechanism and the extent of feeding.	Likely to be feasible legally, although access restrictions and conflicts with existing management plans at sites need to be considered. If habitat modification is needed to install a feed station, then this could impact other features of the SPA.	Can be rapidly implemented and providing benefits as there is existing methodologies for artificial feeding of bird populations that could be replicated. If measure leads to increased survival of adults there is no lead-in time before benefits of the measure are delivered. If supplementary feeding leads to increased productivity only, increase in productivity, there will be a delay between implementation and response in adult breeding numbers (4-6 years).	There is moderate ecological evidence to suggest that this species would potentially benefit from the implementation of this measure.	Whilst productivity and population changes can be readily monitored, and if experimental set-up (control site and supplementary feeding site) is used likely beneficial effects could be demonstrated.	Risk of attracting competitors and potential predatory species (e.g., large gulls), as well as vermin/scavengers. For supplementary feeding, requirement for accessible colonies and/or development of a method for successfully delivering supplementary food to the colony. Supplementary feeding unlikely to be practical since puffin burrows are often inaccessible and disturbance when feeding is likely to detrimentally affect breeding success.
Management of supporting habitats at colonies	Kittiwake	Technically feasible to restore and/or maintain breeding sites through for example the removal of vegetation to recover or create breeding habitat. However, generally not ecologically feasible/relevant for cliff-nesting species.	The developer could either directly fund contractors to undertake discrete packages of work or by providing funding for an additional site manager, thus straightforward and feasible financially.	Unlikely that there would be any legal constraints associated with implementation of this measure unless any proposed management measures would conflict with the conservation objectives of a site, for example if designated as an SAC or negatively impacting other qualifying features.	As this measure targets an increase in productivity, there will be a delay between implementation and response in adult breeding numbers (Age of recruitment is four years).	Unlikely to benefit this species due to cliff-nesting ecology.	Feasible to monitor colonisation in new/restored habitats, and monitor productivity.	At protected sites, habitat management is likely to be part of existing site management and therefore may not be considered additional.
Management of supporting habitats at colonies	Gannet	Technically feasible to restore and/or maintain breeding sites through for example the removal of vegetation to recover or create breeding habitat. However, generally not ecologically feasible/relevant for cliff-nesting species.	The developer could either directly fund contractors to undertake discrete packages of work or by providing funding for an additional site manager, thus straightforward and feasible financially.	Unlikely that there would be any legal constraints associated with implementation of this measure unless any proposed management measures would conflict with the conservation objectives of a site, for example if designated as an SAC or negatively impacting other qualifying features.	As this measure targets an increase in productivity, there will be a delay between implementation and response in adult breeding numbers (4-6 years).	No habitat management needs identified.	Feasible to monitor colonisation in new/restored habitats, and monitor productivity.	At protected sites, habitat management is likely to be part of existing site management and therefore may not be considered additional.
Management of supporting habitats at colonies	Guillemot	Technically feasible to restore and/or maintain breeding sites through for example the removal of vegetation to recover or create breeding habitat. However, generally not ecologically	The developer could either directly fund contractors to undertake discrete packages of work or by providing funding for an additional site manager, thus straightforward and feasible financially.	Unlikely that there would be any legal constraints associated with implementation of this measure unless any proposed management measures would conflict with the conservation	As this measure targets an increase in productivity, there will be a delay between implementation and response in adult breeding numbers (4-6 years).	Unlikely to benefit this species due to cliff-nesting ecology.	Feasible to monitor colonisation in new/restored habitats, and monitor productivity.	At protected sites, habitat management is likely to be part of existing site management and therefore may not be considered additional.

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
		feasible/relevant for cliff-nesting species.		objectives of a site, for example if designated as an SAC or negatively impacting other qualifying features.				
Management of supporting habitats at colonies	Puffin	Technically feasible to restore and/or maintain breeding sites through for example the removal of vegetation to recover or create breeding habitat. However, generally not ecologically feasible/relevant for cliff-nesting species.	The developer could either directly fund contractors to undertake discrete packages of work or by providing funding for an additional site manager, thus straightforward and feasible financially.	Unlikely that there would be any legal constraints associated with implementation of this measure unless any proposed management measures would conflict with the conservation objectives of a site, for example if designated as an SAC or negatively impacting other qualifying features.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. As this measure targets an increase in productivity, there will be a delay between implementation and response in adult breeding numbers (4-6 years).	There is strong ecological evidence to suggest that this species would potentially benefit from the implementation of this measure.	Feasible to monitor colonisation in new/restored habitats, and monitor productivity.	At protected sites, habitat management is likely to be part of existing site management and therefore may not be considered additional.
Seagrass restoration	Kittiwake, Gannet, Guillemot, Puffin	Seagrass restoration has been undertaken in the UK, with guidance and methodology information available.	Costs would be dependent on the extent of restoration required and location accessibility. Contributions to ongoing monitoring and management of existing restoration projects can be an option.	There could be legal requirements surrounding land acquisition or access arrangements depending on the location of the site. If the site is within a designated site boundary (SAC or SSSI), conflicting management activities/ restrictions need to be considered.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. This measure will have a multi-year lead-in time before benefits are delivered, as seagrass needs time to establish before benefits to prey species and subsequently seabirds realise.	Whilst there are clear ecological benefits of seagrass restoration, quantifying the benefits for seabird populations would be highly challenging.	Monitoring guidance is available, thus feasible.Monitoring would be required to determine if additional planting is necessary throughout the measure's lifespan. After the Project's lifespan, it would be useful to establish future management and monitoring agreements to ensure the longevity of the meadow.	The extent of restoration required to compensate for the Project is very difficult to quantify. High uncertainty in quantifying benefits to seabird populations.
Oyster restoration	Kittiwake, Gannet, Guillemot, Puffin	Oyster reef restoration has been undertaken in the UK, with guidance of restoration and monitoring methods available.	Financial costs would be dependent on the extent of restoration required and location accessibility. Contributions to ongoing monitoring and management of existing restoration projects could be considered.	There could be legal requirements surrounding land acquisition or access arrangements depending on the location of the site. If the site is within a designated site boundary (SAC or SSSI), conflicting management activities/ restrictions need to be considered.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. This measure will have a multi-year lead-in time before benefits are delivered, as the oyster reef needs time to establish before benefits to prey species and subsequently seabirds realise.	Whilst there are clear ecological benefits of oyster reef restoration, quantifying the benefits for seabird populations would be highly challenging.	Monitoring guidance is available, thus feasible. Monitoring would be required to determine if further restoration is necessary throughout the measure's lifespan. After the Project's lifespan, it would be useful to establish future management and monitoring agreements to ensure the longevity of the reef.	Provision of sufficient numbers of live oysters to introduce. The extent of restoration required to compensate for the Project is very difficult to quantify, and high uncertainty in quantifying benefits to seabird populations. Ensuring biosecurity e.g., preventing spread of disease caused by Bonamia ostreae.
Kelp bed extension	Kittiwake, Gannet, Guillemot, Puffin	Kelp beds can be feasibly protected and extended by protecting areas from trawling. Active restoration (e.g., transplanting) may also be possible.	Financial costs would be dependent on the extent of restoration required and location accessibility. Contributions to ongoing monitoring and management of existing restoration projects can be an option.	Any fisheries closures would likely need to be delivered in collaboration with local stakeholders and government. There could be legal requirements surrounding land acquisition or access arrangements depending	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. This measure will have a multi-year lead-in time before benefits are delivered, as the kelp	Whilst there are clear ecological benefits of kelp bed restoration, quantifying the benefits for seabird populations would be highly challenging.	Monitoring methods are available. Monitoring would be required to determine if further (active) restoration is necessary throughout the measure's lifespan. After the Project's lifespan, it	The extent of restoration required to compensate for the Project is very difficult to quantify, and high uncertainty in quantifying benefits to seabird populations.

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
				for active restoration. There could be conflict with the fishing industry and large-scale commercial kelp harvesting industries.	needs time to establish before benefits to prey species and subsequently seabirds realise.		would be useful to establish future management and monitoring agreements to ensure the longevity of the reef.	
Reduce agriculture runoff or discharge	Kittiwake, Gannet, Guillemot, Puffin	There are practical challenges in achieving reductions in runoff or discharges whether via collaboration with relevant industries (to achieve direct intervention) or habitat management approaches (due to likely large scale of requirement).	This measure would likely be costly; habitat management would have to be delivered at a very large scale to deliver benefits ecologically.	The stricter regulation of the waste treatment facilities would be regulated by the UK Government and could not be delivered by a developer alone. Habitat management approaches would require stakeholder collaboration and landowner agreement.	The time needed between implementing this measure and benefits to seabirds is currently unclear.	Whilst a reduction in runoff or discharge has ecological benefits, quantifying the benefits for seabird populations would be highly challenging.	Whilst the implementation of the measure can be monitoring (reductions achieved), monitoring knock-on effects on seabirds is not currently feasible.	None identified.
Marine litter removal	Kittiwake, Gannet	The developer could contribute funding to schemes and organisations which undertake removal of marine debris either within coastal or offshore environment, preferably close to the designated sites potentially affected by the OWF development. There would need to be consideration of the feasibility of safely removing plastics from nests. Provision of natural nesting material in close proximity to colonies can have an additional benefit if there is a shortage of material.	It would be feasible to contribute to a fund for the Project alone, collaboratively with other developers or invests in existing clean-up projects of marine debris. The cost for removal at nests sites will be dependent on the frequency of debris removal and the effort required. This could be undertaken by additional wardens, or contractors. Costs would be higher if management was undertaken at remote sites.	There are unlikely to be any legal constraints associated with implementation of this measure. If removal at nesting sites was undertaken during the breeding season while birds were nesting, there would be conflicts with wildlife legislation. Removal of debris could be classed as destruction of a nest, and there would likely be wider disturbance to other breeding birds, so this measure would need to be carefully designed to ensure delivery is appropriate ecologically and legally. Landowner permission and access arrangements would likely be needed.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. Assuming the majority of birds saved from entanglement are juveniles as found in recent studies, there will be a lead-in time of 4-6 years before birds reach breeding age.	There is evidence of plastic use in nests, as well as entanglement (particularly juveniles) in these species. This measure would be ecologically feasible at sites where plastic pollution (and use of plastic in nests) is a known concern.	Whilst monitoring the amount of plastic removed is very straightforward, quantifying the benefits to seabirds may be challenging unless a larger controlled study is set up. The frequency of debris removal would be dependent on the rate of the build-up therefore annual monitoring would be needed for the duration of the measure.	Collected debris would need to be safely removed and disposed of. Quantifying benefits to seabird populations may be challenging (i.e., evidencing that birds were saved through the plastic removal).
Marine litter removal	Guillemot, Puffin	The developer could contribute funding to schemes and organisations which undertake removal of marine debris either within coastal or offshore environment, preferably close to the designated sites potentially affected by the OWF development. There would need to be consideration of the feasibility of safely	It would be feasible to contribute to a fund for the Project alone, collaboratively with other developers or invests in existing clean-up projects of marine debris. The cost for removal at nests sites will be dependent on the frequency of debris removal and the effort required. This could be undertaken by additional wardens, or contractors. Costs would	There are unlikely to be any legal constraints associated with implementation of this measure. If removal at nesting sites was undertaken during the breeding season while birds were nesting, there would be conflicts with wildlife legislation. Removal of debris could be classed as destruction of a nest, and there would likely be wider	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. Assuming the majority of birds saved from entanglement are juveniles as found in recent studies, there will be a lead-in time of 4-6 years before birds reach breeding age.	Plastic entanglement is not reported to be a substantial threat to these species	Whilst monitoring the amount of plastic removed is very straightforward, quantifying the benefits to seabirds may be challenging unless a larger controlled study is set up. The frequency of debris removal would be dependent on the rate of the build-up therefore annual monitoring would be needed for the duration of the measure.	Collected debris would need to be safely removed and disposed of. Quantifying benefits to seabird populations may be challenging (i.e., evidencing that birds were saved through the plastic removal).

Measure	Species	Technical Feasibility	Financial Feasibility	Legal Feasibility	Timing of Delivery	Ecological Feasibility	Monitoring Feasibility	Other Feasibility Considerations
		removing plastics from nests. Provision of natural nesting material in close proximity to colonies can have an additional benefit if there is a shortage of material.	be higher if management was undertaken at remote sites.	disturbance to other breeding birds, so this measure would need to be carefully designed to ensure delivery is appropriate ecologically and legally. Landowner permission and access arrangements would likely be needed.				
Biosecurity	Kittiwake, Gannet, Guillemot, Puffin	The developer would contribute funding to schemes and organisations which undertake biosecurity for invasive species within designated sites potentially affected.	It would be feasible to contribute to a fund for the Project alone or collaboratively with other developers.	There are unlikely to be any legal constraints associated with implementation of this measure if the mechanism is through funding of organisations to undertake the biosecurity.	Can be rapidly implemented and providing benefits as existing technologies and methodologies are available. Assuming increased biosecurity leads to reduction in egg or nest predation, there will be a lead-in time of 4-6 years before "saved" birds reach breeding age.	Whilst there is strong evidence that predation negatively impacts seabirds, and biosecurity is of high ecological benefit, quantitatively linking improved biosecurity to seabird productivity and populations is likely challenging.	There are established methods to monitor incursions, and seabird productivity and populations. Establishing a quantitative link between the two is challenging.	Potential logistical difficulties and high costs in providing rapid response to remote sites. With the recent Biodiversity for LIFE project, it is necessary to identify biosecurity measures and strategies that are additional to what has been implemented already.

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