



Hornsea Project Four: Derogation Information

FFC SPA: Guillemot and Razorbill Compensation Plan

Deadline: 5, Date: 20 June 2022

Document Reference: B2.8

Revision: 02

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Approved Julian Carolan, June 2022

B2.8
Ver. B

Revision Summary

<i>Rev</i>	<i>Date</i>	<i>Prepared by</i>	<i>Checked by</i>	<i>Approved by</i>
01	28/09/2021	GoBe Consultants Ltd, September 2021	Dr Sarah Randall, Orsted, September 2021	Dr Julian Carolan, Orsted, September 2021
02	20/06/2022	GoBe Consultants Ltd, May 2022	Dr Sarah Randall, Orsted, June 2022	Dr Julian Carolan, Orsted, June 2022

Revision Change Log

<i>Rev</i>	<i>Page</i>	<i>Section</i>	<i>Description</i>
01	-	-	Submission at DCO Application.
02	Updated throughout	Updated throughout	Removal of gannet from the Compensation Plan.
02	Updated throughout	Updated throughout	Addition of APP reference numbers.
02	Updated throughout	Updated throughout	Clarification of eradication.
02	Updated throughout	Updated throughout	Updated to reflect progress made since DCO submission on the compensation measures.
02	Updated throughout	Updated throughout	Updated regarding strategic compensation and Marine Recovery Fund.

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Glossary

Term	Definition
Appropriate Assessment (AA)	An assessment to determine the implications of a plan or project on a European site in view of the site's Conservation Objectives. An AA forms part of the Habitats Regulations Assessment and is required when a plan or project is likely to have a significant effect on a European site.
Common guillemot biogeographic population	The north east Atlantic breeding population of guillemot which includes the <i>Uria aalge albonis</i> and <i>Uria aalge aalge</i> subspecies and includes individuals from the Flamborough and Filey Coast SPA (Stroud <i>et al.</i> , 2016). Proposed compensation measures will be undertaken within this populations breeding and migratory range.
Compensation / Compensatory Measures	If an Adverse Effect on the Integrity on a designated site is determined during the Secretary of State's Appropriate Assessment, compensatory measures for the impacted site (and relevant features) will be required. The term compensatory measures is not defined in the Habitats Regulations. Compensatory measures are however, considered to comprise those measures which are independent of the project, including any associated mitigation measures, and are intended to offset the negative effects of the plan or project so that the overall ecological coherence of the national site network is maintained.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
HRA Derogation Provisions	Provisions set out under Regulations 64 and 68 of the Conservation of Habitats and Species Regulations 2017 and Regulations 29 and 36 of the Conservation of Offshore Marine Habitats and Species Regulations 2017 that permit a plan or project with AEOL on a European site(s) to be consented provided the tests derived from Article 6(4) are met i.e. there are no alternative solutions, there are imperative reasons of overriding public interest and that necessary compensation measures are secured.
European site	A Special Area of Conservation (SAC) or candidate SAC (cSAC), a Special Protection Area (SPA) or a site listed as a Site of Community Importance (SCI). Potential SPAs (pSPAs), possible SACs (pSACs) and Ramsar sites are also afforded the same protection as European sites by the National Planning Policy Framework – para 176 (Ministry of Housing, Communities and Local Government, 2019). European offshore marine sites are also referred to as "European sites" for the purposes of this document.
Habitats Directive	European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora
Habitats Regulations	The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017
Habitats Regulations Assessment (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European sites. The process consists of up to four stages: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures

Term	Definition
Hornsea Project Four Offshore Wind Farm	The proposed Hornsea Project Four Offshore Wind Farm project. The term covers all elements of the project (i.e. both the offshore and onshore). Hornsea Four infrastructure will include offshore generating stations (wind turbines), electrical export cables to landfall, and connection to the electricity transmission network. Hereafter referred to as Hornsea Four.
In-Combination Effect	The effect of Hornsea Four in-combination with the effects from other plans and projects on the same feature/receptor.
National Site Network	The network of European Sites in the UK. Prior to the UK's exit from the EU and the coming into force of the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 these sites formed part of the EU ecological network known as "Natura 2000".
Nature Directives	The EU Habitats Directive (European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) and EU Wild Birds Directive (79/409/EEC amended in 2009 to become Directive 2009/147/EC)
Net zero by 2050 commitment	The UK governments legally binding target of achieving net zero greenhouse gas emissions by 2050 as set out in the Climate Change Act 2008 (2050 Target Amendment) Order 2019
Offshore Ornithology Engagement Group (OOEG)	The Hornsea Four Offshore Ornithology Engagement Group means the group that will assist, through consultation the undertaker in relation to the delivery of each compensation measures as identified in the kittiwake compensation plan, the gannet compensation plan and the guillemot and razorbill compensation plan. Matters to be consulted upon to be determined by the Applicant and will include site selection, project/study design, methodology for implementing the measure, monitoring, and adaptive management options as set out in the kittiwake compensation plan, the gannet compensation plan and the guillemot and razorbill compensation plan.
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).
Planning Inspectorate (PINS)	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Razorbill biogeographic population	The breeding population of razorbill which includes <i>Alca torda islandica</i> and includes individuals from the Flamborough and Filey Coast SPA (Stroud et al., 2016). Proposed compensation measures will be undertaken within this populations breeding and migratory range
Report to Inform Appropriate Assessment	The information that the Competent Authority needs to inform an Appropriate Assessment at Stage 2 of the HRA process and which has been provided by the Applicant in [the RIAA (Volume 2, Annex 2: Report to Inform Appropriate Assessment (Part 1) (submitted at Deadline 5), REP2-005, AS-013, REP1-012 and APP-171-APP-178)].
Special Area of Conservation (SAC)	Strictly protected sites designated pursuant to Article 3 of the Habitats Directive (via the Habitats Regulations) for habitats listed on Annex I and species listed on Annex II of the directive.
Special Protection Area (SPA)	Strictly protected sites designated pursuant to Article 4 of the Birds Directive (via the Habitats Regulations) for species listed on Annex I of the Directive and for regularly occurring migratory species.

Term	Definition
The Hornsea Four Offshore Ornithology Engagement Group	The Hornsea Four Offshore Ornithology Engagement Group means the group that will assist, through consultation the undertaker in relation to each compensation measure, site selection, project/study design, methodology for implementing the measure, monitoring, and adaptive management options as identified in the kittiwake compensation plan, the gannet compensation plan and the guillemot and razorbill compensation plan.

Acronyms

Acronym	Definition
AA	Appropriate Assessment
AEOI	Adverse Effect on Integrity
BRAG	Black, Red, Amber, Green.
cSAC	Candidate Special Area of Conservation
DCO	Development Consent Order
DML	Deemed Marine Licence
FFC	Flamborough and Filey Coast
GRCP	Guillemot and Razorbill Compensation Plan
GRCIMP	Guillemot and Razorbill Compensation Implementation and Monitoring Plan
HRA	Habitats Regulations Assessment
JNCC SMP	Join Nature Conservation Council Seabird Monitoring Programme
LEB	Looming Eye Buoy
MMO	Marine Management Organisation
NGO	Non-Governmental Organisation
NFFO	National Federation of Fisheries Organisation
OEL	Ocean Ecology Limited
OOEG	Offshore Ornithology Engagement Group
PINS	Planning Inspectorate
pSACs	Possible Special Area of Conservation
pSPAs	Potential Special Protection Area
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCI	Site of Community Importance
SNCBs	Statutory Nature Conservation Bodies
SPA	Special Protection Area
SU	Swansea University
UK	United Kingdom
UoH	University of Hull
YWT	Yorkshire Wildlife Trust

1 Introduction

1.1 Background

- 1.1.1.1 Orsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network. Detailed information on the project design can be found in [A1.4: Project Description \(APP-010\)](#), with detailed information on the site selection process and consideration of alternatives described in [A1.3: Site Selection and Consideration of Alternatives \(APP-009\)](#).
- 1.1.1.2 The Hornsea Four Agreement for Lease (AfL) area was 846 km² at the Scoping phase of project development. In the spirit of keeping with Hornsea Four's approach to Proportionate Environmental Impact Assessment (EIA), the project has given due consideration to the size and location (within the existing AfL area) of the final project that is being taken forward to Development Consent Order (DCO) application. This consideration is captured internally as the "Developable Area Process", which includes Physical, Biological and Human constraints in refining the developable area, balancing consenting and commercial considerations with technical feasibility for construction.
- 1.1.1.3 The combination of Hornsea Four's Proportionality in EIA and Developable Area Process has resulted in a marked reduction in the array area taken forward at the point of DCO application. Hornsea Four adopted a major site reduction from the array area presented at Scoping (846 km²) to the Preliminary Environmental Information Report (PEIR) boundary (600 km²), with a further reduction adopted for the Environmental Statement (ES) and DCO application (486 km²) due to the results of the PEIR, technical considerations and stakeholder feedback. The evolution of the Hornsea Four Order Limits is detailed in [A1.3: Site Selection and Consideration of Alternatives \(APP-009\)](#) and [A4.3.2: Selection and Refinement of the Offshore Infrastructure \(APP-037\)](#).
- 1.1.1.4 Following the Applicant's DCO submission, the Applicant has revisited its conclusion of no adverse effect on integrity (AEol) in respect of the kittiwake feature of the Flamborough and Filey Coast Special Protection Area (FFC SPA) from Hornsea Four in-combination with other plans and projects and concluded AEol on the FFC SPA in combination with other plans and projects. The Applicant maintains its position of no AEol alone or in combination for all other qualifying species (guillemot, razorbill and gannet) of the FFC SPA and for all other European sites.
- 1.1.1.5 In the DCO Application the Applicant's proposed without prejudice compensatory measures for gannet and kittiwake were presented together in a single [B2.7 Gannet and Kittiwake Compensation Plan \(APP-186\)](#). However, as set out in the Applicant's position paper ([G1.5 Kittiwake AEol Conclusion \(AS-023\)](#)), the Applicant has updated the Applicant's Report to Inform Appropriate Assessment (RIAA) ([B2.2 Report to Inform Appropriate Assessment Part 1](#) (submitted at Deadline 5) and [Part 4 \(REP1-012\)](#)), and its derogation case ([B2.5 Without Prejudice Derogation Case \(REP1-014\)](#)) based on an overall conclusion that there is potential for an AEol on kittiwake at the FFC SPA from Hornsea Four in-combination with

other projects.

- 1.1.1.6 This document sets out the “without prejudice” Compensation Plan for common guillemot *Uria aalge* (guillemot) and razorbill *Alca torda* associated with the Flamborough and Filey Coast (FFC) Special Protection Area (SPA). Collectively it has been termed the Guillemot and Razorbill Compensation Plan (GRCP). It has been developed in support of Hornsea Four should the Secretary of State disagree with the conclusions of the Applicant’s RIAA in relation to the impact of the proposed wind farm on these species and find that adverse effects on the integrity of the FFC SPA cannot be ruled out.
- 1.1.1.7 Specifically, this plan sets out how the preferred measures for compensation for guillemot and razorbill can be secured at the time of DCO approval (should the Secretary of State determine they are required). The compensation measures for guillemot and razorbill have the potential to be delivered either individually or as a suite of measures that benefit in terms of their flexibility and scalability (see [Section 1.3](#)). The flexibility of the measures relates to the implementation of a specific measure to compensate for one species (e.g. the possibility of bycatch to compensate for guillemot at the numbers presented in Revision 2 of [B2.6: Compensation measures for FFC SPA Overview](#) (updated at Deadline 5)) to the implementation of an entire suite of measures to compensate for all species. The scalability of the measures relates to the ability of each individual measure to be scaled to compensate at variable levels (calculations submitted in [G1.41 Calculation Methods of Hornsea Four’s Proposed Compensation Measures for Features of the FFC SPA \(REP1-063\)](#), submitted at Deadline 1).
- 1.1.1.8 The implementation of the respective compensation measures is outlined in the Guillemot and Razorbill Compensation Implementation and Monitoring Plan (GRCIMP), for approval by the Secretary of State, with the aim of ensuring that the compensation package as a whole compensates for the number of guillemot and razorbill affected. All compensation measures are feasible and can be secured while providing flexibility and scalability.
- 1.1.1.9 In this scenario, a draft DCO requirement is presented in this report that the Secretary of State could include in the final DCO for the delivery of the guillemot and razorbill compensation package (see [Section 6](#)).
- 1.1.1.10 Further details on the delivery methodology for the measures, their flexibility and scale will be provided in a GRCIMP, which will be submitted to the Secretary of State to be approved in consultation with Natural England and the MMO, so that the compensation measures could be implemented at least one year prior to the operation of any wind turbine generator. An outline of the GRCIMP (which details its proposed content) is presented in Revision 2 of [B2.8.7: Outline Guillemot and Razorbill Compensation Implementation and Monitoring Plan](#) (submitted at Deadline 5).

1.2 Predicted Effects

- 1.2.1.1 This Guillemot and Razorbill Compensation Plan relates to the potential displacement mortality effect from the operation and maintenance phase of Hornsea Four. The predicted magnitude of this impact on the guillemot and razorbill features of the FFC SPA (cited within [B2.2: Report to Inform Appropriate Assessment \(APP-167-178\)](#)) is presented in [Table 2](#) of Revision 2 of [B2.6: Compensation Measures for FFC SPA Overview](#) (updated at Deadline 5).
- 1.2.1.2 The Applicant has undertaken a robust RIAA ([B2.2: Report to Inform Appropriate Assessment \(Part 1\)](#) (submitted at Deadline 5), [REP2-005](#), [AS-013](#), [REP1-012](#) and [APP-171-](#)

[APP-178](#)) and concluded that based on the available evidence relating to the potential for, and consequence of, displacement to guillemot and razorbill, it does not consider there to be potential for adverse effect on integrity (AEol) (for either species) to the conservation objectives of the FFC SPA either from project alone or in-combination with other plans and projects.

1.3 Compensation Measures

1.3.1 Background

- 1.3.1.1 In the event that the Secretary of State is unable to reach a conclusion of no AEol on the FFC SPA for guillemot and / or razorbill, the Applicant has developed a “without prejudice” package of compensation measures that could be applied to compensate at scalable levels for predicted displacement impact on guillemot and / or razorbill, from Hornsea Four.
- 1.3.1.2 The proposed compensation measures for guillemot and razorbill are outlined in [Table 1](#) and are presented in detail in [Sections 3 to 5](#). The location of the search area for these measures (as well as the other measure being proposed for Hornsea Four) is shown in [Figure 1](#). A suite of measures are proposed, which provides the benefits of flexibility and scalability, as outlined above. The Applicant is confident that each of the measures on their own is robust and deliverable, committing to a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. It is important to note that if deemed necessary, the Applicant can deliver all relevant compensatory measures and the resilience measure for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill).
- 1.3.1.3 There are two primary compensation measures being proposed for guillemot and razorbill. The objective of the first is to reduce bycatch at a chosen fishery or fisheries hence reducing the number of direct mortalities per annum. The second is to undertake a predator eradication programme for a chosen island(s)/ islet(s) which will achieve an improvement in guillemot and/ or razorbill population numbers as a consequence of the removal of this pressure. Finally, as part of the package of measures to support guillemot and razorbill (and as outlined within the Kittiwake Compensation Plan and Gannet Compensation Plan), fish habitat enhancement will also be undertaken at a chosen location. The habitat restored (namely, seagrass) will support a number of fish species upon which guillemot and razorbill (and seabirds more generally including kittiwake and gannet) target as prey resource, therefore, this measure serves as a more indirect means to offer resilience to the guillemot and razorbill populations within the targeted area(s).
- 1.3.1.4 The Applicant has already gathered a significant amount of evidence at this stage to deliver (if necessary) the compensation measure outlined below. This is to provide the Secretary of State with sufficient confidence at the point of authorising Hornsea Four that the compensation will deliver the required outcomes.
- 1.3.1.5 Information is presented in [Sections 3 to 5](#) on a measure-by-measure basis and draws on evidence presented in the associated evidence reports ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#); [B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence \(APP-196\)](#); and [B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence \(APP-198\)](#)). To avoid repetition, this document should be read alongside each relevant Evidence Report. However, a brief summary of the key evidence that underpins the

compensation measure is provided in this report.

- 1.3.1.6 It should be noted that for each of the proposed measures a roadmap document has also been produced by the Applicant which details the next steps that will be undertaken should the compensation measure be required. These roadmaps accompany the DCO application and are documents Revision 4 of [B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap](#) (updated at Deadline 5), Revision 4 of [B.2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) (updated at Deadline 5) and Revision 4 of [B2.8.6 Compensation measures for FFC SPA: Fish Habitat Enhancement: Roadmap](#) (updated at Deadline 5). These documents demonstrate that the compensation measures are feasible and can be secured.

1.3.2 Strategic Compensation

- 1.3.2.1 The Applicant has amended the DCO wording in [Section 6](#) to reflect their intention to rely upon the option to discharge their obligation of compensation through the delivery of strategic compensation. The detail of strategic compensation approach and the Marine Recovery Fund (MRF) is set out in within [G5.8 Ørsted's approach to strategic ecological compensation](#) (submitted at Deadline 5), and set out in the Roadmaps. If the Applicant has elected to pay a contribution to the Marine Recovery Fund ("MRF") or equivalent fund then the relevant section in the KCIMP shall include the sum of the contribution as agreed between the Applicant and the Department for Environment Food and Rural Affairs (Defra) in consultation with the OOEG. If the contribution is in substitution for one or more of the compensation measures, then the relevant sections in the KCIMP will not be completed as they will no longer be required. For the avoidance of doubt, the Applicant's obligations to deliver compensation measures shall either be discharged through the delivery of strategic compensation through the contribution to the MRF, or through the delivery of compensation measures as set out within this compensation plan, with either option detailed within the KCIMP.
- 1.3.2.2 Alternatively, if the contribution to the MRF is an adaptive measurement measure then the relevant section of the KCIMP shall include details as to the trigger for payment of the contribution (see [Section 6](#)).

Hornsea 4

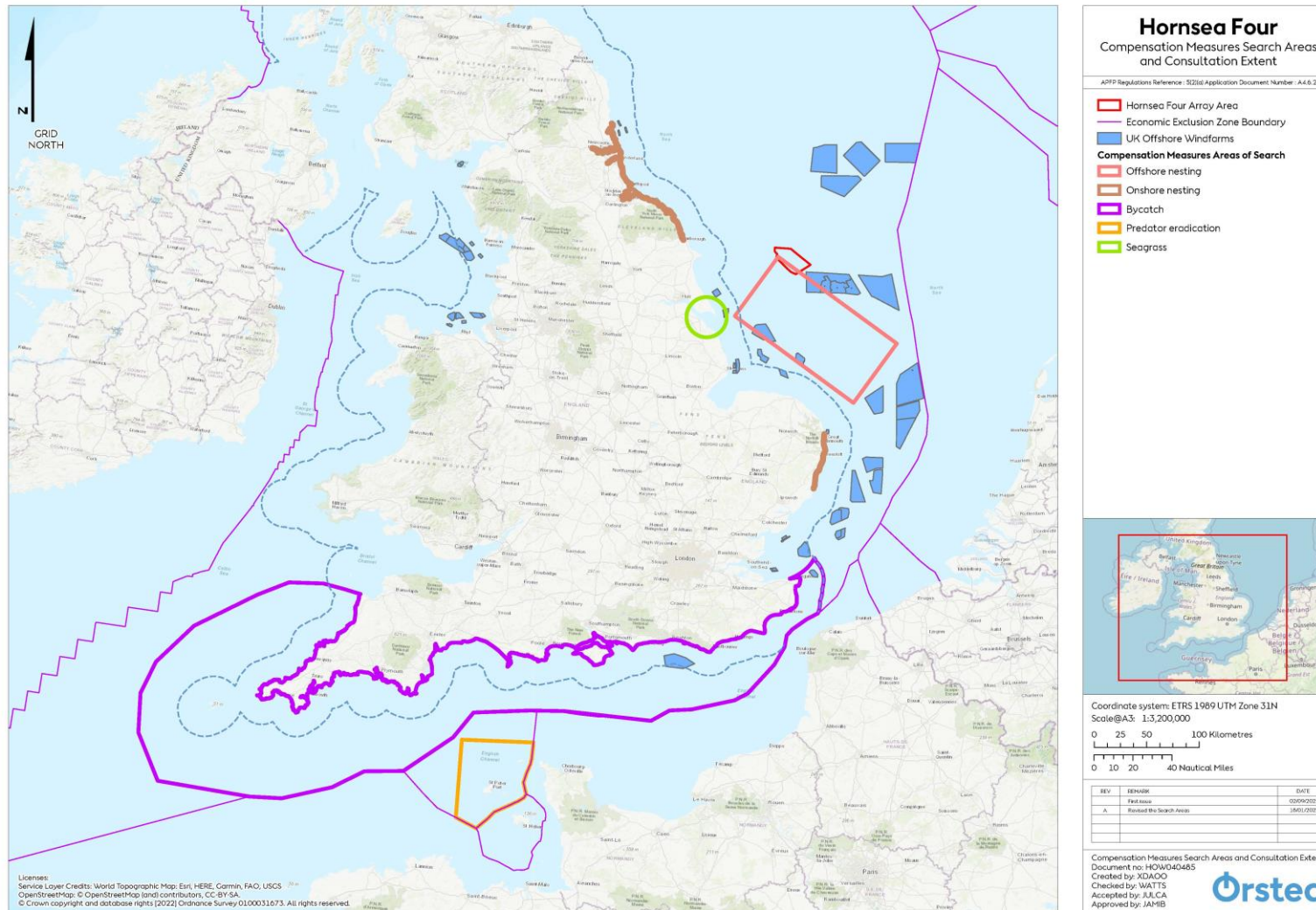


Figure 1: Location of areas of search for all compensation measures proposed for Hornsea Four.

Table 1: Compensation Measures proposed by Hornsea Four for guillemot and razorbill.

Compensation Measure	Target Species	Summary
Bycatch reduction	Guillemot Razorbill	Measures involve the initial identification of guillemot and razorbill bycatch rates in UK fisheries and techniques that may be deployed to reduce this. Following the implementation of a method/ methods monitoring will be undertaken to assess the bycatch rates of guillemot and razorbill. See Section 4 for further details.
Predator Eradication (dependent on location)	Guillemot Razorbill	Measures involve the initial identification of a suitable island(s) or islet(s) with guillemot and razorbill colony/colonies which also supports a population of predators. Following a successful implementation assessment, an eradication project would take place with subsequent monitoring for productivity of the guillemot and razorbill population. Biosecurity is a key site management protocol to limit potential invasions during eradication and re-infestations following the eradication project. For a control project, this would be set up and monitored over the course of the project with biosecurity measures to help reduce numbers present. This would form the second stage of the delivery of this measure. See Section 3 for further details.
Fish Habitat Enhancement	Guillemot Razorbill	This measure would comprise the enhancement of the chosen site where seagrass beds have been known to previously exist and works undertaken to restore (or reinstate) this habitat. The success of the reinstatement would be monitored along with the recording of increased biodiversity within the habitats including fish species. See Section 5 for further details.

1.4 Stakeholder Engagement

- 1.4.1.1 The Applicant has undertaken extensive consultation with relevant stakeholders (namely, Natural England, Joint Nature Conservation Committee (JNCC), the Royal Society for the Protection of Birds (RSPB), the Marine Management Organisation (MMO), the Planning Inspectorate (PINS), Defra, The Crown Estate, The Wildlife Trust, East Riding or Yorkshire Council (ERYC) and The National Federation of Fishermen’s Organisations, on the compensation measures for Hornsea Four. Further detail on this consultation is presented in the Record of Consultation ([B2.9: Record of Consultation \(APP-201\)](#)).
- 1.4.1.2 If the Secretary of State determines that compensation is required, following the DCO being granted, a Hornsea Four Offshore Ornithology Engagement Group (OOEG) will be established with core members being the relevant Statutory Nature Conservation Bodies (SNCBs) and the MMO. The RSPB will also be invited to form part of the OOEG, as an advisory member. The purpose of this group will be to help shape and inform the nature and delivery of the compensation post consent.

1.4.1.3 The Applicant will engage with and report to the OoEG at least annually in the establishment phase and as needed, and as documented in GRCIMP throughout the monitoring period. Terms of Reference will be agreed between the parties which will also be submitted to the Secretary of State for approval. The Applicant will be the chair and convener of the OoEG.

2 Guidance

2.1 European Commission Guidance

2.1.1.1 This Guillemot and Razorbill Compensation Plan takes into consideration information from Defra 2012 Guidance¹, Defra Best Practice Guidance for developing compensatory measures in relation to Marine Protected Areas 2021 (in consultation),² European Commission (EC) 2018 Managing Natura 2000 sites³, the Planning Inspectorate's Advice Note Ten⁴, and Tyldesley and Chapman's Habitats Regulations Assessment (HRA) Handbook⁵. The EC 2018 guidance identifies that the following criteria be considered when developing compensatory measures:

- Coordination and cooperation between Natura 2000 authorities, assessment authorities and the proponent of the plan or project;
- Clear objectives and target values according to the site's conservation objectives;
- Description of the compensatory measures, accompanied by a scientifically robust explanation of how they will effectively compensate for the negative effects and how they will ensure the overall coherence of Natura 2000 is protected;
- Demonstration of the technical feasibility of the measures in relation to their objectives;
- Demonstration of the legal and/or financial feasibility of the measures according to the timing required;
- Analysis of suitable locations and acquisition of the rights to the land to be used;
- Timeframe in which the compensation measures are expected to achieve their objectives;
- Timetable for implementation of compensation and co-ordination with the schedule for the project implementation;
- Public information and/or consultation stages;
- Specific monitoring and reporting schedules; and
- Financing programme.

2.1.1.2 Where appropriate, these have been addressed through the subsequent sub-headings in this Guillemot and Razorbill Compensation Plan and also in the accompanying roadmaps (Revision 4 of [B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap](#) (updated at Deadline 5), Revision 4 of [B.2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) (updated at Deadline 5) and Revision 4 of [B2.8.6 Compensation measures for FFC SPA: Fish Habitat Enhancement: Roadmap](#) (updated at Deadline 5)).

¹ Defra (2012), Habitats and Wild Birds Directives: Guidance on the application of article 6(4) - alternative solutions, imperative reasons of overriding public interest (IROPI) and compensatory measures. December 2012.

² Best Practice guidance for developing compensatory measures in relation to Marine Protected Areas (in consultation).

³ EC (2018). Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Brussels, 21.11.2018 C(2018) 7621 final.

⁴ Planning Inspectorate (2017). Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects. November 2017, Version 8.

⁵ Tyldesley, D. and Chapman C. (2013-2019). The Habitats Regulations Assessment Handbook, 2019 edition UK: DTA Publications Limited. Note that this publication is an on-line handbook that is updated periodically.

2.2 Conservation Objectives

2.2.1.1 The Conservation Objectives for the FFC SPA are to ensure that the integrity of the site is maintained or restored as appropriate and ensure that the site contributes to achieving the aims of the Birds Directive, by maintaining or restoring (see [B2.2: Report to Inform Appropriate Assessment \(REP1-010, REP2-005, AS-013, REP1-012 and APP-171-APP-178\)](#) for further detail):

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and,
- The distribution of the qualifying features within the site.

2.2.1.2 Given the potential impact pathway of Hornsea Four wind farm for which compensation is required, it is the latter two points only which are of relevance. The evidence presented within this Guillemot and Razorbill Compensation Plan and supporting annexes demonstrates that the proposed measures are capable of more than compensating for the estimated impact of Hornsea Four wind farm on the qualifying guillemot and razorbill (as determined by the Secretary of State). Whilst the measure cannot be undertaken within the FFC SPA, the birds that the compensation measure will generate will assimilate into the biogeographic population of guillemot and the biogeographic population of razorbill and thereby ensure the coherence of the national site network in the UK is maintained. Further information to support this is provided in ([G3.4.1: Compensation measures for FFC SPA: Ecological Connectivity of Compensation Measures Annex 1 \(REP3-034\)](#) (submitted at Deadline 3)).

3 Predator Eradication

3.1 Introduction

3.1.1.1 This Guillemot and Razorbill Compensation Plan would only take effect if the Secretary of State determines that Hornsea Four would have an AEol on guillemot and / or razorbill feature of the FFC SPA and imposes a DCO requirement for the provision of compensation. The following sections provide an overview of the key aspects which have been evidenced by the Applicant to date to provide the Secretary of State with sufficient confidence in predator eradication as a compensation measure for Hornsea Four. This has included the following key aspects:

- Evidencing that the eradication of predators can provide benefits to guillemot and razorbill colonies;
- Evidencing that predator eradication and general island enhancement efforts are feasible and supported by a wealth of evidence;
- Identifying a set of suitable locations where a predator eradication scheme could be undertaken to benefit guillemot and razorbill;
- Evidencing the anticipated population response by guillemot and razorbill following the predator eradication project; and
- Evidence for monitoring, bio-security measures and adaptive management measures to demonstrate the long-term sustainability of the measure.

3.1.1.2 While the following sections provide a brief overview of the evidence in support of the

measure for guillemot and razorbill, to avoid repetition a detailed overview of the evidence supporting this compensation measure is provided in [B2.8.3: Guillemot and Razorbill Predator Eradication Evidence Report \(APP-196\)](#). Therefore, the evidence report should be read alongside this Compensation Plan.

- 3.1.1.3 The EC Guidance recognises that the feasibility of the identified compensation measure must be based on the best scientific knowledge available. The novelty of developing compensation for guillemot and razorbill increases the importance of pre- and post-implementation monitoring. There will, following award of consent, be a phase of further evidence gathering followed by monitoring which will continue through operation. Where necessary, monitoring and adaptive management will ensure, in line with Guidance, that the proposals are developed in the most appropriate manner and can be flexible to enable modifications to be made where evidence suggests it is merited. It is important to recognise that the compensatory measure proposed here is part of a package of one or more compensation measures which provide resilience across the compensation actions for guillemot and razorbill. This high level of precaution must be factored in when considering any uncertainty in the measure. These topics are covered in the following sections of the report.
- 3.1.1.4 Should this compensation measure be deemed necessary, the next steps required to implement it by the Applicant are set out in a Predator Eradication Roadmap (Revision 4 of [B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) (updated at Deadline 5)).

3.2 Summary of Evidence

- 3.2.1.1 Globally, guillemot and razorbill encounter many factors which influence adult survival and breeding success. Factors such as overfishing and over-exploitation of sand-eels (Nettleship, 2018) are leading to shortages of high energy foods needed for rearing chicks (Wanless *et al.*, 2005). There are indications that the decline in sandeel stocks is linked to increasing sea surface temperatures (Heath *et al.*, 2009) which poses risk to razorbills due to their restricted diet (Sandvik *et al.*, 2005). Guillemot are also sensitive to variations in sea surface temperatures, with a 1°C change in temperature linked to an annual population decline of approximately 10% (Irons *et al.*, 2008). Alongside these pressures, invasive predators (e.g., O'Hanlon and Lambert, 2017), fisheries bycatch (Northridge *et al.*, 2020), oil pollution (Biliavskiy and Golod, 2012; Furness, 2013), increases in plastic pollution also represent threats to guillemot and razorbill populations.
- 3.2.1.2 Colony population and nest surveys are undertaken to assess the overall adult breeding population and breeding success of a colony which can be consequently linked to external factors influencing a population (Gjerdrum *et al.*, 2003). Predation of seabird eggs, nestlings and adult birds has been shown to be one such influencing factor. Guillemot and razorbill have been evidenced to be vulnerable to numerous species of predator, especially those breeding on islands (Thomas *et al.*, 2017) such as American mink (e.g., Olsson, 1974; Barrett, 2015) and black and brown rats (e.g., Swann, 2002; Mavor *et al.*, 2004; Russell, 2011).
- 3.2.1.3 There is also the potential for other mammalian predators to impact guillemot and razorbill in the UK such as feral ferrets, house mice and hedgehogs. However, most evidence of UK mammalian predation on both guillemot and razorbill comes from both brown and black rats. There is strong evidence that predator eradication programmes increase seabird breeding success. The excessive predation by rats on guillemot and razorbill can result in

exceptionally low chick mean survival rates (Barrett, 2015), declines in productivity (O’Hanlon and Lambert, 2017) and potentially the elimination or redistribution of nesting seabird colonies, forcing the remaining concentration onto inaccessible locations to rats (Booker *et al.*, 2018; Andersson, 1999; Mavor *et al.*, 2004).

- 3.2.1.4 Recent evidence from Lundy Island in the south west of England provides one example of compelling support for rat eradication to benefit breeding guillemot and razorbill (with further more detailed examples provided in **B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)**).
- 3.2.1.5 Lundy Island is situated 19km off the Devon coast in the UK’s Bristol Channel. Lundy is occupied by eleven seabird species, including razorbill and guillemot. The island was also occupied by both brown and black rat, which led to the establishment of the Seabird Recovery Project in 2001. The projects main aim was to improve the conditions for burrow-nesting seabirds (such as puffin and European storm petrels) through the eradication of brown and black rats, however it was also anticipated that other species will also benefit. From 2002–2004 a ground-based eradication operation was undertaken, and in 2006 Lundy was officially declared rat-free (Booker *et al.*, 2018).
- 3.2.1.6 The seabird populations of Lundy have been well studied with detailed regular data collection spanning the last 35 years. Over the last decade, as a result of rat removal, seabird numbers on the island have doubled and European storm petrels have colonised. By 2013, the breeding population of Manx shearwaters increased more than ten-fold to an estimated 3,451 pairs (JNCC, 2020). With regard to guillemot and razorbill, both species had reduced populations prior to the eradication programme, with increases in populations at the sites following eradication. **Table 2** shows the pre- and post-eradication population of guillemot and razorbill at Lundy.

Table 2 Seabird populations at Lundy before and after eradication. Count type: IND. Source: BTO/JNCC (JNCC, 2021) and recording coordinated by the Lundy Field Society.

Count year	Guillemot	Razorbill
1992	2629	785
1996	1921	959
2000	2348	950
Predator eradication 2002-2004		
2004	2321	841
2006 - Lundy declared rat-free		
2008	3302	1045
2013	4114	1324
2017	6198	1735
2019	6415	1955
2020	8252	2177
2021	9880	3533

- 3.2.1.7 National trends reported by JNCC show that Lundy’s seabirds are generally faring better when compared to the wider UK (JNCC, 2020). The latest trend information for guillemots have increased by 5% nationally between 2000 and 2015 and razorbills by 32% in the same period (JNCC, 2016). However, the population increases for Lundy are considerably higher for these species at 164% and 82% respectively between 2000 and 2017 (Booker *et al.*,

2018). The population of guillemot at Lundy as of 2017 is at a level not seen since the late 1940s (Davis and Jones, 2007). Additional years of survey data have been collected since the publication of Booker *et al.* (2018) showing further increases in the populations of guillemot and razorbill nesting at Lundy. These show that there has been a population increase of 321% for guillemot and 272% for razorbill from 2000 (before rat eradication) to 2021 (15 years after the island was declared rat-free).

- 3.2.1.8 On a regional scale, when comparing the populations of guillemot and razorbill from before and after the Lundy eradication with other neighbouring colonies, results show that there has been a significant increase at Lundy compared to other nearby colonies since 2004, including Skomer and Castlemartin Coast. This population change is documented in full in the Guillemot and Razorbill Predator Eradication Evidence Report ([B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence \(APP-196\)](#)).
- 3.2.1.9 The site specific evidence shows that substantial increases in guillemot and razorbill numbers have occurred since 2004 with Lundy now supporting almost three times the number of guillemots recorded in 2004 with the population currently at a level not recorded since the late 1940s (Davis and Jones, 2007). This pattern is also coincident with the increase in Manx shearwaters (Booker and Price, 2014). Booker *et al.* (2018) and Price *et al.* (2014) suggest that the absence of rats is the likely main driver for such positive changes. An increase in productivity of both species since the eradication has also been shown (Wheatley and Saunders, 2011), with Sherman (2020) showing an increase in guillemot productivity in particular between 2008-2019 at certain locations of the colony.
- 3.2.1.10 Other notable changes reported by Booker *et al.* (2018) were the prevalence of birds, including guillemots, razorbills and puffins now exploiting previously unoccupied areas of broken ground where the cliff top meets the steep grassy coastal slopes. These areas were previously occupied by rats but are now available as safe nest sites. Alongside these areas, seabirds are generally colonising new sites, with sizeable increases in numbers along the south coast as well as from Jenny's Cove northwards with the change being particularly apparent at Jenny's Cove where breeding numbers of most species have seen the biggest increase Booker *et al.* (2018).
- 3.2.1.11 The Lundy predator eradication provides an insight into the anticipated benefits to guillemot and razorbill as a result of removing predator species from island seabird colonies. Those benefits being:
- Increase in the population of guillemot and razorbill present at the colony;
 - Increases in breeding success; and
 - Recolonisation of breeding sites within the colony.
- 3.2.1.12 Despite the Lundy predator eradication scheme focusing primarily on the recovery of Manx shearwater and European storm petrel, long term monitoring has shown the benefits to other seabird species, including guillemot and razorbill.
- 3.2.1.13 The focus on burrow nesting species, such as Manx shearwater and European storm petrel is commonplace in predator eradication projects across the UK, and for similar species elsewhere in the world. In the UK, both species of burrow nester are listed under Annex 1 of the EU Birds Directive and are largely confined to islands (Mitchell *et al.*, 2014). The positive effects of predator eradication to Manx shearwater and European storm petrel, and other species for that matter, can be profound. A review of the positive responses of other seabird

species as a result of UK eradication projects is presented by Thomas *et al.*, (2017).

- 3.2.1.14 Based on the evidence briefly outlined here and in further detail in the Guillemot and Razorbill Predator Eradication Evidence Report (**B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)**), this compensation measure, therefore, will address the occurrence of predators at a guillemot and/ or razorbill colony(ies) in the UK via the initiation of an invasive species predator eradication project.

3.2.2 Objective and Scale

- 3.2.2.1 The objective of this compensatory measure is to eradicate target predator species for the chosen island(s) or islet(s) to benefit guillemot and razorbill productivity at the chosen colony or colonies. The target species for the eradication would be black and/or brown rats (depending on the species of rat present on the island(s)/ islet(s) of the proposed eradication programme, noting other invasive species would also be considered). While the full extent of the recovery will not be seen until successive breeding seasons after the eradication of the target predator species, the eradication will start reducing the predation pressure relatively quickly, particularly if implemented during the non-breeding season when forage available to rats is likely to be limited. It is therefore expected that benefits to the breeding seabird populations will be evident the first breeding season following the initiation of the eradication programme. Following predator eradication, if monitoring demonstrates that the island(s)/ islet(s) meets the qualifying criteria for an SPA (and the location is within UK or Channel Islands), Hornsea Four will work with relevant stakeholders to provide evidence for designation.
- 3.2.2.2 The final location(s) within the Bailiwick of Guernsey and, therefore, scale of this measure will be agreed post-ground truthing (described below). It is important to note that the island/ islet locations presented in the Site Selection section of this report are cumulatively able to deliver significantly more nesting habitat to guillemot and razorbill than is required by the compensation (both in terms of the Applicant's position and the assessment approach used for recent DCO decisions). Guillemot have the smallest breeding territories of any Atlantic breeding seabird (Harris & Birkhead, 1985) and are therefore able to breed at very high densities in suitable habitat. Some UK colonies support a density of 20 pairs per square metre on flat rocks and up to 70 pairs per square metre where the surface is uneven (Harris & Birkhead 1985). While breeding density is likely to be lower for razorbill based on their preference at some colonies to nest in crevices and burrows, the number of pairs required by the compensation measure is significantly lower.
- 3.2.2.3 The number of nesting pairs required to produce the predicted impact are detailed within **Table 2** of Revision 2 of **B2.6: Compensation Measures for FFC SPA Overview** (updated at Deadline 5). Consequently, a relatively low amount of habitat would be required to support the number of pairs required at the short-listed location. Furthermore, predator eradication is a scalable compensation option which can be implemented at multiple feasible locations to achieve the required amount of breeding habitat to support the target compensation population. Based upon a precautionary assessment, the Applicant would consider predator eradication at 1-3 locations, which would be determined following a predator eradication implementation study. This scale will provide considerable compensation over and above the potential impact of Hornsea Four.
- 3.2.2.4 Biosecurity measures will be put in place from the beginning of the eradication scheme to limit the chances of invasion during and re-infestation following the eradication. An adaptive

management approach will be taken in order to ensure that there is sufficient flexibility and that the required compensation is delivered. The compensation measures are clearly effective, viable and can be secured.

3.3 Site Selection

3.3.1 Introduction

3.3.1.1 The following sections summarise the results of the site selection process undertaken to date, which is provided in the Guillemot and Razorbill Predator Eradication Evidence Report ([B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence \(APP-196\)](#)), and the future site refinement approach (informed by the implementation study) that will be undertaken to identify a candidate island(s) or islet(s) for an eradication project.

3.3.2 Island Identification

3.3.2.1 The initial site selection process highlighted a number of potential locations which support populations of guillemot and/ or razorbill colonies⁶, rats (brown and/or black rats⁷) and where a predator eradication scheme is potentially feasible. These are⁸:

- Bailiwick of Guernsey:
 - Alderney: A number of islands/ islets around the main island;
 - Herm: Including Herm, The Humps and Jethou; and
 - Sark: A number of islands/ islets around the main island.
- Isles of Scilly: A number of Islands/ islets;
- Rathlin Island; and
- Several islands/ islets along the south coast of England.

3.3.2.2 Further details on how these sites were selected are provided in the Guillemot and Razorbill Predator Eradication Evidence Report ([B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence \(APP-196\)](#)).

3.3.3 Further Site Refinement & Island Ground Truthing

3.3.3.1 The initial location options for predator eradication presented in [Section 3.3.2](#), were identified as a result of the initial site selection process. Further site refinement was undertaken involving preliminary site visits by island enhancement experts, site managers and/ or ornithologists to provide further evidence in support of the eradication proposal. This process was undertaken alongside continued consultation with site/ reserve managers, wardens, landowners, NGOs, the local community and other relevant stakeholders to determine a location's feasibility. From the initial location options presented in [Section 3.3.2](#), the following islands have been selected for a potential predator eradication scheme:

- Bailiwick of Guernsey:
 - Alderney: A number of islands/ islets around the main island;

⁶ Note that all of the following overarching locations contain populations of nesting guillemot and razorbill, however, not all islands and islets around these locations, that may be considered for eradication, have both species present.

⁷ Presence of black rats has been confirmed at, at least two sites.

⁸ Note that exact island names for some locations are not disclosed due to confidentiality/ on-going discussions which are commercially sensitive.

- Herm: Including Herm, The Humps and Jethou; and
- Sark: A number of islands/ islets around the main island.

3.3.3.2 The Applicant has presented evidence that guillemot and razorbill originating from North Sea colonies (i.e. in proximity to FFC SPA) are likely to migrate through or disperse to the waters in the English Channel/ Channel Islands (**G3.4.1: Compensation measures for FFC SPA: Ecological Connectivity of Compensation Measures Annex 1 (REP3-034)** (submitted at Deadline 3)) and therefore demonstrated the connectivity to the UK National Site Network and benefit to the UK National Site Network populations.

3.3.3.3 A ground truthing exercise in the form of an eradication implementation study is being undertaken by the Applicant (prior to the grant of the DCO) to gather further evidence to ensure success of the eradication project, and feed into the decision making process. As mentioned above in paragraph **3.1.1.4**, the Predator Eradication Roadmap (**B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap** (submitted at Deadline 5)) sets out the planned next steps. The ground truthing exercise will include site implementation assessments, focussed on understanding in greater detail the following topics detailed in paragraphs 3.3.3.4-3.3.3.9. Where previous island predator eradication feasibility assessments have been undertaken, documents will be reviewed and discussed with eradication experts to judge whether the previous reports are still relevant to the scope of the planned eradication, or whether an update is required to collect more recent information. Each consideration will be presented in a black, red, amber, green (BRAG) matrix approach to allow a transparent rank-based decision-making process to be documented. If following these studies it is considered that further sites should be explored, the Applicant will return to the original long-list of potential sites for further ground truthing and site refinement (see **B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence Appendix 1 (APP-196)**).

Logistical considerations for undertaking an eradication scheme

3.3.3.4 The implementation study has considered whether or not a predator eradication project could be technically feasible at the location, including factors such as access and other logistical requirements. This has been undertaken in conjunction with landowners, site managers and island enhancement experts. Through the findings of the implementation study to date, the Applicant is confident that a predator eradication project will be technically feasible at the chosen location of the Bailiwick of Guernsey. Resident questionnaires have shown that the majority of people support control and/ or eradication of rats. There is also support for predator control (and eradication at the surrounding islets) at Alderney from AWT and the States of Alderney (see Letter of Comfort in Appendix A of Revision 4 of **B8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap (submitted at Deadline 5)**). Further information is presented in the predator eradication implantation update (**G5.4 Predator Eradication Implementation Update** (submitted at Deadline 5)). The implementation study will continue through to August, and is therefore not complete at the time of writing. Further updates from the implementation study will be sent to the relative stakeholders if required.

Presence of target predator species

3.3.3.5 This section will determine the species and degree of predator presence at island locations and the level of overlap between the predator occurrence and guillemot and razorbill nesting locations. This is being conducted by predator eradication specialists and ecologists

to allow realistic abundance estimates to be made and a prediction of the effort required to achieve their eradication or the most effective methods (Roy *et al.* 2015).

- 3.3.3.6 Previous methods used in the UK have included the use of chewsticks (wooden spatulas saturated with margarine or lard that are chewed and bitten by rats) which were set around the island and checked or replaced daily during a period of 6 months (typically during winter when populations are likely to be lowest) (Zonfrillo, 2001). Additionally, cage traps, camera traps and ink tunnels can also be used (Roy *et al.* 2015). Undertaking the survey during the non-breeding season avoids disturbance to breeding seabirds, but depending on the timing, could limit access to islands during periods of severe weather and therefore the timeframes have been considered carefully in the design of the surveys. Predator surveys will be undertaken during and after the eradication project to monitor the abundance/presence of invasive predators, using appropriate methods that will be defined in due course.

Additional site-specific evidence of predation pressure

- 3.3.3.7 Surveys of the islands are being undertaken to document further site-specific evidence of predation of guillemot and razorbill eggs, nestlings or adults. The survey will collect data such as egg caches, gnawed seabird carcasses, photographic evidence from cameras, invasive predator tissue testing (such as stable isotope analysis of caught individuals), or other methods determined as appropriate.

Potential nesting habitat assessment

- 3.3.3.8 An assessment of colony habitat is being undertaken to determine the amount of potential nesting habitat available to guillemot and razorbill following the removal of the predators. This is being undertaken by ornithologists and subsequently analysed to determine potential nesting space (see [G1.33 Predator eradication island suitability assessment: Bailiwick of Guernsey](#) submitted at Deadline 5). Islands where guillemot and razorbill populations have historically been larger will be considered to have proven capacity for increased productivity.

Colony Census

- 3.3.3.9 A complete island seabird census will also be undertaken following methods presented in Walsh *et al.*, (1995) and will include collection of productivity data and species population estimates. This will form the baseline for future population and productivity assessment if the island is included in the eradication project. Long-term seabird monitoring is described in the sections below. Information may also be collected on other flora and fauna and general island enhancement following the removal of the invasive species.

3.3.4 Additional considerations

- 3.3.4.1 There are also a number of other considerations which will be incorporated into the decision-making process in a qualitative manner. For example, there is additional biosecurity risk from human populations on islands (the larger the population the greater the risk of invasive species arriving), and therefore preference would be given to uninhabited islands or islands with a low human population. This process is detailed within the respective Roadmap ([B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) (updated at Deadline 5) which details the process to identifying the most suitable island for eradication. It is important to note that all shortlisted islands currently included by the Applicant are appropriate for eradication. The predator eradication implementation update ([G5.4](#)

Predator Eradication Implementation Update (submitted at Deadline 5)) will provide further information which informs the refinement of the island(s) and islet(s) being considered most suitable to compensate for the potential impact of Hornsea Four. The studies being undertaken by predator eradication experts are expected to conclude in autumn 2022 and will inform the selected island(s)/islet(s).

- 3.3.4.2 The FFC SPA is designated for a number of breeding seabird species including (in addition to guillemot and razorbill): kittiwake, gannet and a breeding seabird assemblage consisting of fulmar, puffin, herring gull, shag and cormorant. Those species nesting in burrows (such as puffin) or on the ground/in accessible areas (such as razorbill, shag and cormorant) have increased vulnerability to predation from predators when compared to cliff nesting species. Burrow nesting species are known to benefit from predator eradication projects, with multiple reports of increased breeding success following the removal of key predators. It is, therefore, likely that numerous species will benefit from eradication projects in addition to the reduced predation pressure on just a single target seabird species (Ratcliffe *et al.* 2019). In order to ascertain the assemblage of other seabird species breeding at each island, the JNCC SMP will also be used to explore other breeding seabird species.
- 3.3.4.3 Unassisted re-invasion of islands by predators is a potential threat to islands previously eradicated which are within swimming distance of infested islands or the mainland (Tabak *et al.* 2015). Protocols to limit potential re-invasions will be instated at islands during and following the eradication programme and are further detailed in the biosecurity measure section below.

3.3.5 Stakeholder Engagement

- 3.3.5.1 The Applicant will continue to work with all necessary stakeholders as part of the Offshore Ornithology Evidence Group (OOEG) throughout this process to ensure suitable locations are identified and that any work is reflective of current best practice. Shortlisted locations have been identified outside the UK (but with connectivity to the national site network) and have been included within the Applicant's eradication implementation study which has covered engagement from respective country conservation bodies (both statutory and non-statutory). Further information is found within the predator eradication Roadmap (Revision 4 of **B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap** (updated at Deadline 5)).
- 3.3.5.2 The Applicant recognises the importance of the local community in the implementation (and maintenance) of the predator eradication and biosecurity measures. The Applicant will therefore consult with the local community (where one is present) and any relevant local organisations such as wildlife trusts. Efforts will also be taken to learn from previous predator eradication programmes such as on the Isles of Scilly Seabird Recovery Project⁹.

3.3.6 Timescale

- 3.3.6.1 A predator eradication implementation study is currently being undertaken by the Applicant to gather further evidence to ensure success of the eradication project, and feed into the decision making process of which island(s)/islet(s) to take forward. The study is expected to conclude in autumn 2022 and will include the results of the full breeding bird survey and further analysis to inform implementation. Although this evidence will not be available until

⁹ <https://ios-seabirds.org.uk/>

after the Examination the confidence in the feasibility and likely success of the measure is not in question. The purpose of the additional evidence is to ensure the Applicant can implement the measure without delay. Based on the evidence collected during the site visits, eradication implementation studies and presented within [G5.4: Predator Eradication Implementation Study Update](#), the Applicant is highly confident it has determined locations where predator eradication is highly feasible, deliverable and will result in benefits to guillemot and razorbill. Further information is found within the Predator Eradication Roadmap (Revision 4 of [B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) (updated at Deadline 5) and the [G.5.4 Predator Eradication Implementation Study Update](#) (submitted at Deadline 5)).

Delivery Process - Eradication Programme

- 3.3.6.2 Following the BRAG approach outlined above, members of the OOEG will be consulted as part of the site selection process for the predator eradication programme and further landowner discussions will be undertaken, where applicable.
- 3.3.6.3 The approach taken to the delivery of predator eradication will be detailed in the Guillemot and Razorbill Compensation Implementation and Monitoring Plan (GRCIMP). Additionally, implementation of the compensation measure will take into account the UK Rodent Eradication Best Practice Toolkit (2018), and any relevant additional consideration of location specific issues. Predator eradication will be undertaken by professional island enhancement experts using well established methods evidenced throughout the wealth of previous island enhancement examples from the UK and further afield. Previous eradication projects have used rodenticide which will be first tested against the target predator population to ensure no resistance. Other methods of eradication may also be deemed feasible. If this is found to be the case, alternative methods will be explored in conjunction with the OOEG.

3.3.7 Biosecurity

- 3.3.7.1 At the initiation of the eradication of predators from the chosen location, biosecurity measures will be put in place to prevent invasion of further target predators. This will be carried on following the removal of the target predator to prevent re-infestation. For example, previous projects have implemented vector control including vessel control and bait traps at arrival points to minimise chance of reinvasion and surveillance procedures including chew sticks at points around islands to identify early signs of reinvasion. Previous successful biosecurity measures have been implemented on islands in the UK that have undergone predator eradication such as at Canna and Sanday, measures consisting of continuous monitoring (wax blocks and kill traps), quarantine and contingency plans have prevented the reinvasion of rats since being declared rat free in 2008 (Luxmoore *et al.*, 2019).
- 3.3.7.2 Biosecurity measures will be in-line with the current RSPB Biosecurity for LIFE project which was initiated to safeguard the UK's internationally important seabird islands (European Commission, 2019). The RSPB project aims to improve biosecurity measures across all of the UKs 41 seabird island SPAs and establish response plans when invasive species are reported at island SPAs (RSPB, 2019). The biosecurity measures will aim to replicate the RSPB Biosecurity for LIFE project in conjunction with the OOEG, including the RSPB who have significant experience in island biosecurity.
- 3.3.7.3 The Applicant has already undertaken site visits to locations where predator eradication

schemes have been undertaken to understand the potential level of biosecurity controls (for example, St. Agnes and Cugh on the Isles of Scilly). Such information will complement and inform biosecurity planning at a site specific level of detail for the compensatory measure.

3.4 Implementation Criteria and Monitoring

Proposed implementation criteria

- 3.4.1.1 The aim of the scheme is to completely remove the target species from the chosen area. After the eradication is complete, intensive monitoring for the presence of the eradicated predators will be undertaken to verify successful eradication.
- 3.4.1.2 Consequently, any eradication programme needs to be coupled with adequate biosecurity protocols to prevent the reinvasion or new invasion of an invasive species. While this is not a success criteria *per se*, it is vital that a set of biosecurity measures are installed to sustain the subsequent population response of breeding seabirds.
- 3.4.1.3 As a result of the key considerations given above, a summary of proposed key criteria for an eradication programme is:
- Identify the necessary amount of suitable nesting habitat;
 - Target predator removal from location;
 - Implementation of adequate biosecurity measures; and
 - Seabird monitoring of the following¹⁰;
 - Productivity rates;
 - Breeding population; and
 - Distribution of breeding birds.

Monitoring

- 3.4.1.4 A monitoring package including the frequency, duration and nature of the monitoring methodology, will be designed with the delivery partner and in consultation with the OOEG. Monitoring will focus on the progress and confirmation of eradication, and guillemot and razorbill productivity at the location. The objective of the monitoring is to record the population response at the chosen locations.
- 3.4.1.5 Invasive monitoring will commence following the baiting or trapping campaign and will follow the established methods outlined by the eradication contractor. It is anticipated that this monitoring will last at least two years to record the removal of target species from the location.
- 3.4.1.6 Monitoring for re-infestation on the location will continue for the operational phase of the project, at a frequency to be approved with the relevant approval authority. This will be included with the biosecurity compensatory measures.
- 3.4.1.7 In order to monitor guillemot and razorbill and explore the response of other species of seabird at the location to the removal of (invasive) predators, a breeding seabird census project will be initiated to collect population data. Details of seabird monitoring will be determined after initial ground truthing surveys have been completed. To show the changes

¹⁰ Noting that changes in populations and productivity must be considered in the context of natural variation. Any long-term challenges to the effectiveness of predator eradication relating to prey resource should be viewed in a region specific context and in consideration of natural variability and climate change. Furthermore, monitoring for certain metrics will be based on risk of disturbing nesting species. A decision on exact monitoring will be made following the identification of the island and in discussion with the OOEG.

as a result of the predator eradication project, population increases will be provided in the context of local, regional and national trends. This will involve undertaking seabird censuses at other local/ regional guillemot and razorbill colonies (the number of which will be determined at a later stage in consultation with the OOEG), while comparing the national trend to JNCC seabird population analysis publications will be assessed. This will show population changes at the colony where an eradication has been undertaken relative to a regional level change. As an example, this was explored within the Lundy Island case study presented within the Guillemot and Razorbill Predator Eradication Evidence Report (**B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)**) where the Lundy Island guillemot and razorbill population had increased above the percentage change experienced by local razorbill and guillemot colonies within the region. This suggests predation pressure from rats was likely to have had an impact beyond what other external influences had.

- 3.4.1.8 Monitoring will continue for the operational phase of the project, at a frequency to be detailed in the GRCIMP. It is envisaged that the delivery partner will lead the monitoring component of this measure.
- 3.4.1.9 The breeding population detailed in **Table 2** of Revision 2 of **B2.6: Compensation Measures for FFC SPA Overview** (updated at Deadline 5) is predicted to provide the number of chicks that would survive to adulthood to offset the impact of Hornsea Four. There are examples of predator eradication schemes resulting in population increases for both species which are significantly greater than this size, see Guillemot and Razorbill Predator Eradication Evidence Report (**B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)**).
- 3.4.1.10 This number of birds would be required to be produced for each year (on average) that the Hornsea Four wind farm is in operation (and therefore when the impact may take place). The compensation measure is a long-term commitment, with monitoring and adaptive management built in to ensure the long-term success of the measure. A key function of the OOEG would be to help define appropriate and proportionate success criteria, the detail of which will be presented within the final GRCIMP.
- 3.4.1.11 Any mortality debt accrued by the compensation measure will be paid of relatively quickly in relation to the lifetime of the offshore wind farm. It is highly likely that a mortality surplus will be accrued by the end of Hornsea Four's lifetime. Mortality debt and surplus will be informed by monitoring and will be discussed with stakeholders via the OOEG process.
- 3.4.1.12 Monitoring will be necessary to evidence any changes to guillemot and razorbill productivity. However, changes in populations and productivity must be considered in the context of natural variation. Any long-term challenges to the effectiveness of predator eradication relating to prey resource should be viewed in a region specific context and in consideration of natural variability and climate change.
- 3.4.1.13 As highlighted in 3.2.1.13, and in further detail in Thomas *et al.*, (2017), positive population responses are also expected to occur (and likely to be an even greater extent than for guillemot and razorbill) to other seabird species present at the predator eradication location. The scale of these positive population responses will depend on the final location(s) of the eradication project. All seabird species present at the location will be monitored concurrently with guillemot and razorbill to document the response of seabird population responses, in addition to the target of the compensatory measure. This will include population census as a minimum. Historic records of breeding species and habitat

assessments for other potential breeding species will be sought to determine the chances of species repatriation/ establishment following eradication. For example, the first Manx shearwater chick to fledge on Lundy for almost 50 years, and the first of that species to fledge in living memory from the island of St. Agnes and Gugh on the Isles of Scilly were the result of rat eradication projects (Thomas *et al.*, 2017).

3.4.1.14 It is also important to note the Hornsea Four Outline Ornithological Monitoring Plan report (**F2.19: Outline Ornithological Monitoring Plan (APP-254)**) which outlines the proposed approach and objectives of any ornithological monitoring required by the Deemed Marine Licences (DMLs) prior to the granting of development consent. The report considers both guillemot and razorbill along with other seabird species (including gannet and kittiwake).

3.4.2 Adaptive Management

3.4.2.1 If monitoring indicates that the compensation measure is not fully achieving its objectives as planned, the reasons for this will be investigated, the OOEG will be consulted and options identified for improving the eradication programme.

3.4.2.2 Adaptive monitoring will also contextualise the colony population responses of other seabird species (such as Manx shearwater, European storm petrel and puffin) to the eradication project. This will be accomplished by the multi-species population monitoring mentioned above.

3.4.2.3 Measures presented by the Applicant (presented in **Table 1**) have been developed to be flexible and scalable and therefore can be increased as necessary to respond to feedback or requirements identified by the adaptive management process.

3.4.2.4 An alternative approach than that outlined in paragraph 3.4.2.1 is for the Applicant to contribute to a fund as an adaptive management measure. Reference can be made to the Marine Net Gain - Consultation on the principles of marine net gain dated 7th June 2022 (Defra, 2022), which includes reference to the newly announced Marine Recovery Fund (MRF). The MRF proposes a "contributions based approach" to net gain requirements, but has been given a broad application to be used to develop strategic compensation. The MRF forms part of the Offshore Wind Environmental Improvement Package of the BESS. The Applicant has proposed some wording below in **Section 6** in relation to the option to contribute to the MRF for adaptive management.

3.4.3 Reporting

3.4.3.1 Seabird colony information (such as population size) will be collected during the predator eradication implementation study with the production of subsequent reports to provide a characterisation of the island(s). Annual reports will be produced throughout the eradication process (or different frequency to be agreed with the OOEG), with subsequent seabird monitoring reports being delivered every two years in line with colony census timescales.

3.5 Outline Timeline

3.5.1.1 The activities required to carry out the actions set out above (which will be outlined in the GRCIMP) are well understood due to previous UK experience of island enhancement. Hornsea Four have commissioned the world's most experienced eradication experts to undertake the predator eradication implementation study. The Applicant undertook site visits to short listed locations during the summer of 2021 with further and more detailed site

investigations being undertaken across shortlisted locations within the Bailiwick of Guernsey as part of the predator eradication implementation study. The Applicant will seek to develop the measures as soon as possible following a legally secure consent decision, with all surveys being complete prior to Financial Investment Decision. The GRCIMP will be supplied to the Secretary of State prior to the operation of any wind turbine, and the GRCIMP will be approved by the Secretary of State in consultation with relevant key stakeholders before the operation of any wind turbine generator.

- 3.5.1.2 The Policy paper 'British Energy Security Strategy'¹¹ (BESS) published by BEIS in April 2022 recognises the even greater need for rapid development of offshore wind farms committing to 'cut the process time by over half' and 'helping to speed up delivery timelines'.
- 3.5.1.3 Predator eradication measures could be initiated relatively quickly once the site implementation assessments as part of the ground truthing process are complete and following DCO consent award. However, the length of eradication process will be dependent on the population of target species and size of island. Based on previous examples explored in the Guillemot and Razorbill Predator Eradication Evidence Report (**B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)**), island eradication usually takes place over a period of up to two years, but it is anticipated that benefits to guillemot and razorbill populations would be evident the first breeding season following the eradication start (due to a reduction in the number of predators present). Following the identification of the final location, a more precise timeframe will be determined by the predator eradication specialists. Productivity monitoring for guillemot and/ or razorbill will be evaluated over a number of breeding seasons and will be detailed in the GRCIMP. Hence this measure will be implemented prior to the project impact (displacement from an operational turbine array) arising (see timelines in Revision 4 of **B2.8.4 Compensation Measures for FFC SPA Predator Eradication Roadmap** (updated at Deadline 5)).

3.5.2 Island Designation Status

- 3.5.2.1 If an island is not a designated site (such as a Ramsar site) but is selected as a location for the compensation delivery, it could then subsequently be eligible for designation either individually or as an extension of a designated site, providing that it meets the qualification requirements.

3.6 Habitat Enhancement and Corvid Control

- 3.6.1.1 Following the identification of the location intended for predator eradication, engagement with the OOEG will also look to identify habitat management measure (such as the removal of invasive plant species) to increase the resilience of the measure and potential increase nesting habitat available to guillemot and razorbill. Furthermore, corvid control, such as through the use of trap cages used at Cap Fréhel - Cap d'Erquay for local regulation, may also be put in place if deemed to be an influencing factor on the guillemot and razorbill population at the colony.

¹¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf

4 Bycatch Reduction

4.1 Introduction

4.1.1.1 The Applicant is proposing to reduce fishing bycatch of guillemot and razorbill as compensation for Hornsea Four. This compensation measure is feasible and can be secured.

4.1.1.2 The following sections provide an overview of the key aspects which have been evidenced by the Applicant to provide the Secretary of State with sufficient confidence in bycatch reduction as a compensation measure for Hornsea Four. This has included the following key aspects:

- Evidencing that a high degree of guillemot and razorbill bycatch occurs within certain fisheries;
- Evidencing that particular locations, which have connectivity with guillemot and razorbill from Southern North Sea breeding populations, have particularly high levels of bycatch;
- Identifying a set of bycatch reduction techniques available to reduce bycatch to guillemot and razorbill;
- Evidencing the anticipated reduction in guillemot and razorbill mortality following the implementation of bycatch reduction as a compensation measure; and
- Evidence for monitoring and adaptive management measures to demonstrate the long-term sustainability of the measure.

4.1.1.3 While the following sections provide a brief overview of the evidence in support of the measure for guillemot and razorbill, to avoid repetition a detailed overview of the evidence supporting this compensation measure is provided in the Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)). Therefore, the evidence report should be read alongside this Compensation Plan.

4.1.1.4 The EC Guidance recognises that the feasibility of the identified compensation measure must be based on the best scientific knowledge available. The novelty of developing compensation for guillemot and razorbill increases the importance of pre- and post-implementation monitoring. There will, following award of consent, be a phase of further evidence gathering followed by monitoring which would continue through operation. Where necessary, monitoring and adaptive management will ensure, in line with appropriate Guidance, that the proposals are developed in the most appropriate manner and can be flexible to enable modifications to be made where evidence suggests it is merited. It is important to recognise that the compensatory measure proposed here is part of a suite of compensation measures which provides the benefits of flexibility, scalability and resilience across the compensation actions for guillemot and razorbill. This high level of precaution must be factored in when considering any uncertainty in the measure. These topics are covered in the following sections of the report.

4.1.1.5 The process for identifying, securing and finalising a suitable fishery/ location, bycatch reduction technology selection, implementation, monitoring and adaptive management measures (in so far as the ecological aspects are concerned) is discussed further in [Section 4.4](#) of this report with full details provided in the Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)).

4.1.1.6 Should this compensation measure be deemed necessary, the next steps required to implement it by the Applicant are set out in a Bycatch Reduction Roadmap ([B2.8.2](#)

[Compensation measures for FFC SPA: Bycatch Reduction: Roadmap](#) (submitted at Deadline 5)).

4.2 Evidence

- 4.2.1.1 The impact of bycatch from commercial fishing activity on global seabird populations is an acknowledged concern (Žydelis *et al.*, 2013; Anderson *et al.*, 2011; Miles *et al.*, 2020). Dias *et al.* (2019) reports that seabird bycatch is one of the top three threats to global seabird numbers, affecting just under 100 species globally and being responsible for the greatest average impact on seabird numbers. A large focus on fisheries bycatch research and subsequent bycatch reduction has focused on long line fisheries, however, it has been reported that gillnet fisheries are likely to pose a greater risk to global seabird populations (Žydelis *et al.*, 2013; Pott and Weidenfeld, 2017; Dias *et al.*, 2019). Žydelis *et al.* (2013) conservatively estimated that 400,000 seabirds are killed each year globally in gillnet fisheries. Despite this, bycatch monitoring and reporting is vastly underestimated, with low onboard observer monitoring coverage compared to the scale of commercial fishing (Pott and Wiedenfeld, 2017). Many estimates of bycatch mortality are derived from incidental recordings of bycatch. There are few monitoring programmes of long-term datasets available and fewer from dedicated bycatch monitoring programmes (ICES, 2018).
- 4.2.1.2 Guillemot and razorbill are all vulnerable to bycatch at the surface and pelagic zone whilst also being vulnerable to deep waters techniques during the deployment and hauling of nets (Bradbury *et al.*, 2017). Globally, the Report of the Workshop to Review and Advise on Seabird Bycatch (ICES, 2013) found guillemot and razorbill to be a likely or known bycaught species of the following types of gear; trammel nets and set gillnets, set longlines and purse seines.
- 4.2.1.3 In the UK, a preliminary assessment (running since 1996) has focused on quantifying protected species bycatch, through an at-sea observer data collection programme under the UK Bycatch Monitoring Programme (BMP). The UK BMP have collected data from over 21,000 monitored fishing operations from around the UK and adjacent waters with the aim to collect operational, environmental, and catch/bycatch data, to estimate bycatch rates of several protected species. Between 1996 and 2018, bycatch was measured for three gear types: static net (set gillnet), midwater trawl and longline. Recent analysis of the data collected by the UK BMP has helped to close some knowledge gaps and identify areas of concern (Northridge *et al.*, 2020; Miles *et al.*, 2020). It was estimated that between 1,800 to 3,300 guillemots and 100 to 200 razorbill are bycaught in UK fisheries every year (Northridge *et al.*, 2020). The Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)) provides a detailed and comprehensive review of bycatch evidence in UK waters and provides further analysis of bycatch estimates relative to guillemot and razorbill.
- 4.2.1.4 There is therefore the potential to alleviate bycatch for these species by implementing bycatch reduction techniques within areas of high bycatch. This compensatory measure, therefore, would seek to address the bycatch rate of guillemot and razorbill at fisheries in the UK via the initiation of a bycatch reduction project.

4.2.2 Objective and Scale

- 4.2.2.1 The objective of this compensatory measure is to attain a reduction in the rate of bycatch mortality for guillemot and razorbill in UK waters by the implementation of bycatch

reduction techniques. The upper scale of compensation required would be defined in the Secretary of State's Appropriate Assessment.

- 4.2.2.2 The scale of the implementation will be dependent on the level of existing bycatch at a particular fishery, and the efficiency of reduction bycatch by the chosen bycatch reduction technique. An example of potential scale based on existing evidence and previous bycatch reduction trials is provided within the Bycatch Reduction Evidence Report (**B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)**). The Applicant has developed an innovative, novel study testing the efficiency of the Looming Eyes Bouy (an above water deterrent) at reducing guillemot and razorbill bycatch in gillnet fisheries. The bycatch technology selection phase has been completed with promising results. The outcomes from the bycatch reduction selection phase will inform the implementation of bycatch reduction as compensation (findings submitted within **G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary**) (submitted at Deadline 5)). Further information including timelines of the bycatch reduction selection phase is provided within the Bycatch Roadmap (Revision 4 of **B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap** (updated at Deadline 5)). The bycatch technology selection phase will be discussed with OoEG members and presented within the GRCIMP for approval by the Secretary of State.
- 4.2.2.3 The bycatch technology selection phase has provided confidence in the measure, scale and locations, as set out within the Bycatch Roadmap (**B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap (APP-192)**). Based upon the bycatch technology selection phase, the Applicant will consider provision of bycatch reduction measures on 8 vessels, which have been informed following the bycatch reduction technology selection phase (see findings within **G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary**) (submitted at Deadline 5)). These compensation measures have the benefit of being flexible and scalable to enable successful delivery of the compensation.

4.3 Fisheries Selection

- 4.3.1.1 The following sections describe the site selection process that has been used to identify fisheries suitable for the bycatch reduction project, with worked examples presented where relevant.

4.3.2 Introduction

- 4.3.2.1 The Bycatch Reduction Evidence Report (**B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)**) provides a detailed update to the Northridge *et al.*, (2020) estimates by incorporating more recent fishing effort data and other analyses (such as bycatch risk mapping) (Bradbury *et al.*, 2017) to identify the following:
- Annual trends over a longer period of time;
 - Recent possible bycatch estimates;
 - Spatial bycatch trends;
 - Seasonal bycatch trends; and
 - Areas of high bycatch risk.

4.4 Delivery Process

4.4.1 Fishery Type

- 4.4.1.1 The likelihood of guillemot and razorbill being caught in fishing gear varies depending on many factors, including: gear type (longline, net, trawl, and active/passive), depth in water column (surface, demersal, benthic), net size, and time of day (day/night). Northridge *et al.*, (2020) provides an analysis of the UK BMP dataset for seabird bycatch numbers in different gear types in the UK including guillemot and razorbill.
- 4.4.1.2 Guillemots account for approximately 75% of bycatch observed in static net fisheries, both coastal and offshore, and 85% from midwater trawls, with no observations of guillemot being caught in longline fishing. Annual bycatch mortality of guillemot is estimated in the region of between 1,600 to 2,500 individuals per year, with the majority of these attributed to coastal net fisheries (Northridge *et al.*, 2020).
- 4.4.1.3 Razorbill were observed in coastal static net fisheries, English Channel midwater trawl fisheries, and few recorded in longline fisheries. The majority of mortalities are attributed to static net fisheries with estimated mortality approximately 100-200 birds per annum in static net and midwater trawls (Northridge *et al.*, 2020).
- 4.4.1.4 While the majority of guillemot and razorbill bycatch is a result of gillnet fisheries (see analysis by Northridge *et al.*, 2020 and updated estimates in the Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)), Northridge *et al.* (2020) also stated midwater trawlers catch guillemot and razorbill, through evidence obtained from the UK BMP. However, guillemot and razorbill are not thought to be affected by midwater trawls through warp strike or through diving into the nets due to not being attracted to vessels. Instead, it has been suggested that guillemot and razorbill are bycaught due to foraging within the same area of the vessel (Simon Northridge *pers. comm.*). The individuals will be caught whilst foraging and will ultimately be drowned within the catch prior to the net being hauled back onto the boat. As larger vessels pump the catch onto a separator then into cold water containers at a high speed, birds can easily be missed therefore bycatch counts would be inaccurate. This would be particularly apparent for guillemot and razorbill due to their small size (Simon Northridge *pers. comm.*). Due to this reason, it is likely that bycatch from midwater trawls is greatly underestimated and could be of concern for seabird populations.
- 4.4.1.5 A review of this, alongside other available literature and information obtained from fishermen and bycatch specialists has been undertaken by the Applicant to identify potential fishery types that have high guillemot and razorbill bycatch rates. The Applicant has also made significant endeavours at this stage to attempts to collaborate and synergise workstreams regarding seabird bycatch. Efforts will continue to ensure efficiency across industry and conservation bodies, while also eliminating duplication of efforts.

4.4.2 Fishery Location

- 4.4.2.1 Initial bycatch risk mapping (see [B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)) identifies distinct spatial and temporal points where bycatch rate is high for guillemot and razorbill. These are generally located within the autumn and winter months, inshore, and along the south coast of England (the English Channel). Two locations are particularly apparent from the process, the south east of

England, and the south west of England. Based on the findings presented in Appendix A of the Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)), guillemot and razorbill originating from North Sea colonies (i.e. in proximity to FFC SPA) are likely to migrate through or disperse to the waters in the English Channel ([G3.4.1: Compensation measures for FFC SPA: Ecological Connectivity of Compensation Measures Annex 1 \(REP3-034\)](#) (submitted at Deadline 3)). This finding partially explains the increased densities of both species in the non-breeding season within this area, with birds bycaught in the English Channel during this period potentially being from breeding colonies along the north east coastline of England. Furthermore, fisherman consultation has been undertaken with both static net fishermen and midwater trawlers and the results are summarised in [B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#).

- 4.4.2.2 The above information was shared with SNCBs. The SNCBs agreed that the south west and south east coast of England was the most appropriate location for bycatch reduction of guillemot and razorbill in gillnet fisheries (Natural England and RSPB *Pers comm.* (meetings held 28th July 2021 and 7th February 2022), [F3.4 Statement of Common Ground between Hornsea Project Four and Natural England: Derogation Matters \(APP-257\)](#) and [Deadline 4 Submission - Appendix C4 – Comments on G3.4 Compensation measures for Flamborough and Filey Coast \(FFC\) Special Protection Area \(SPA\) Compensation Connectivity Note \(REP4-056\)](#)).

4.4.3 Bycatch risk mapping

- 4.4.3.1 A process outlined by Bradbury *et al.*, (2017) has been followed using seabird density and other variables to highlight areas of increased bycatch risk. This process is outlined in [B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#). Furthermore, bycatch rates have been estimated in Northridge *et al.* (2020) through an average of bycatch recorded per haul by the UK Bycatch Monitoring Programme (BMP). These estimates were combined with the most recent fishing effort (extracted from the MMO) to highlight the current level of UK bycatch.
- 4.4.3.2 As the Northridge *et al.* (2020) estimates do not consider spatial or temporal differences, bycatch risk mapping was completed to identify “risk zones” of areas of high seabird density and high fishing effort. These zones identified important areas for bycatch reduction, identifying the south west and south east of England as important areas to focus within for bycatch reduction as compensation. This information was shared with SNCBs and informed the site selection process for the bycatch technology selection phase (noting agreement of the selected locations with the SNCBs).
- 4.4.3.3 The findings of the bycatch technology selection phase are presented within [G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary](#) (submitted at Deadline 5).

4.4.4 Bycatch Reduction Technique Selection

- 4.4.4.1 A variety of bycatch reduction measures have been tested globally for a range of fishing gear and seabird species. An extensive literature review has been completed to understand the effectiveness of different bycatch reduction methods and to identify potential techniques that may reduce guillemot and razorbill bycatch rates in UK fisheries. This is presented within the Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures](#)

for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)).

4.4.4.2 In light of the findings of this review and the results of the bycatch technology selection phase, it is proposed that potential bycatch reduction techniques for guillemot and razorbill focus initially on above water deterrents (the Looming Eye Buoy) (see [B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#) for rationale).

4.4.4.3 The Applicant entered the bycatch reduction technology selection phase in November 2021 to identify which bycatch measure(s) would be best to use in the bycatch reduction project¹² for guillemot and razorbill. The selection phase involves at sea deployment of bycatch reduction devices (the Looming Eyes Buoy (LEB)) within an active fishery. The selection phase also involves control nets as well as experimental nets where specific bycatch reduction technology has been trialled. The methods of the selection phase has been developed in conjunction with collaborators (such as NGO's and fishermen) and bycatch reduction technology developers to ensure best practice and a robust approach. The Applicant is undertaking the LEB selection phase with two companies:

- 1) FishTek Marine Ltd
 - FishTek are a global leader in developing bycatch reduction techniques and have previously developed techniques which have successfully aided in reducing bycatch in fisheries (e.g., Hookpod, Lumo lead, pingers).
- 2) SeaScope Fisheries Research
 - SeaScope are an independent consultancy who specialise in fisheries monitoring and research.

4.4.4.4 Through collaborating with two companies which have both undertaken successful studies within fisheries science, the Applicant is confident with the progress of the testing of the LEB and that the measures required for a successful study have been undertaken.

4.4.4.5 The bycatch reduction technology selection phase has been completed with promising results. The outcomes from the bycatch technology selection phase are presented within [G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary](#) (submitted at Deadline 5).

4.4.4.6 Further information in relation to next steps for bycatch reduction technology selection is presented in the Bycatch Roadmap document ([B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap](#) (submitted at Deadline 5)).

4.4.5 Stakeholder Engagement

4.4.5.1 The Applicant will continue to engage with relevant stakeholders (including the fishing industry) to ensure the success of the bycatch reduction implementation and that any work is reflective of current best practice. During early fisheries consultation, fishermen were asked "Would you be willing to adopt any proposed measures in a pilot study, should they be paid for by Ørsted?". The response was positive, with 80% of fishers in Cornwall saying they would participate (42 out of 52 responses). This shows the willingness of members of the fishing industry to participate in the exercise – which is paramount to its success. Furthermore, fishers from the bycatch reduction technology selection phase have agreed to

¹² Note that bycatch reduction techniques likely to be used for gannet have previously undergone testing and would therefore unlikely to need a trial.

take part in the implementation of the bycatch reduction technique in 2022/2023. The Applicant is also currently securing more fishers, increasing the total number of fishers using the bycatch reduction technology. This positive relationship with the fisheries industry and willingness of fishers to participate will aid the Applicant when deploying the compensation measures post DCO consent.

4.5 Implementation of the Bycatch Reduction Project

- 4.5.1.1 The results of the bycatch technology selection phase and potential adaptive management are presented within [G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary](#) (submitted at Deadline 5). Members of the OOEG will be consulted on a final fishery/ fisheries location, and the intended bycatch reduction technique for the compensation measure. Relevant fisheries stakeholder discussions will also be undertaken.
- 4.5.1.2 The approach taken to the delivery of bycatch reduction will be discussed with the OOEG as part of the development of the GRCIMP, taking into account the considerations of fisheries stakeholders and any relevant additional consideration of location specific issues.
- 4.5.1.3 The implementation of the bycatch reduction project will be overseen by a suitably qualified delivery partner such as a commercial fisherman/ technical specialist contractor.

4.6 Implementation Criteria and Monitoring

- 4.6.1.1 The primary aim of the scheme is to reduce the bycatch of guillemot and razorbill to offset the impacts of Hornsea Four. As highlighted in [Section 1.2](#), and set out in full within the Bycatch Reduction Evidence Report ([B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)) the scale will be dependent on the final impact derived from the Secretary of State's Appropriate Assessment. However, based on the Applicant's position presented in the Hornsea Four RIAA, the number of possible mortalities as a result of displacement by Hornsea Four per annum is presented in [Table 2](#) of Revision 2 of [B2.6: Compensation Measures for FFC SPA Overview](#) (updated at Deadline 5).
- 4.6.1.2 Based upon the bycatch reduction technology selection phase, the Applicant will provide bycatch reduction measures across 8 vessels (see findings within [G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary](#)) (submitted at Deadline 5)). The number of vessels will be discussed with SNCBs within the OOEG.

Monitoring

- 4.6.1.3 A monitoring package will be designed with the delivery partner and will be discussed with the OOEG (see monitoring methods within [G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary](#)) (submitted at Deadline 5)). Monitoring will focus on the progress and confirmation of a reduction in bycatch numbers for guillemot and razorbill. This will be informed by the bycatch reduction technology selection phase (comparing the bycatch of the control nets to the experimental nets). Due to the high resolution of the camera system used during the bycatch reduction technology selection phase, the same system may be used at times during the lifetime of the project to complement the other monitoring measures. The monitoring of results would be dependent on the implementation method. However, bycatch reduction monitoring for bycatch of other taxa is well known and synergies can be drawn and incorporated into the monitoring relevant to guillemot and razorbill. This will be developed with experienced stakeholders from both a conservation

and fisheries background to ensure monitoring requirements are met.

- 4.6.1.4 Monitoring will continue for the operational phase of the project, at a frequency to be detailed in the GRCIMP. It is envisaged that the delivery partner will lead the monitoring component of this measure. See the Bycatch Roadmap (Revision 4 of [B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap](#) updated at Deadline 5) for further information on monitoring.
- 4.6.1.5 As stated above, it is also important to note the Hornsea Four Outline Ornithological Monitoring Plan report ([F2.19: Outline Ornithological Monitoring Plan \(APP-254\)](#)) which outlines the proposed approach and objectives of any ornithological monitoring required by the DMLs prior to the granting of development consent. The report considers both guillemot and razorbill along with other seabird species (including gannet and kittiwake).

4.6.2 Adaptive Management

- 4.6.2.1 Adaptive management is an iterative, post-consent process which combines management measures and subsequent monitoring with the aim of improving effectiveness, whilst also updating knowledge and improving decision making over time. An adaptive management plan will be produced and outlined in the GRCIMP which will list a set of options to ensure the long-term resilience of the measure if monitoring indicates that the bycatch reduction measures are performing unfavourably or failing to be implemented by fisheries. This process will be developed in consultation with the OOEG. If the bycatch mitigation technique proves to be unsuccessful during implementation, another technique or fishery type may be chosen for bycatch reduction in consultation with the OOEG.
- 4.6.2.2 Measures presented by the Applicant (presented in [Table 1](#)) have been developed to be scalable and therefore can be increased as necessary to respond to feedback or requirements identified by the adaptive management process.
- 4.6.2.3 An alternative approach than that outlined in paragraph 4.6.2.1 is for the Applicant to contribute to a fund as an adaptive management measure. Reference can be made to the Marine Net Gain - Consultation on the principles of marine net gain dated 7th June 2022 (Defra, 2022), which includes reference to the newly announced Marine Recovery Fund (MRF). The MRF proposes a "contributions based approach" to net gain requirements, but has been given a broad application to be used to develop strategic compensation. The MRF forms part of the Offshore Wind Environmental Improvement Package of the BESS. The Applicant has proposed some wording below in [Section 6](#) in relation to the option to contribute to the MRF for adaptive management.

4.6.3 Reporting

- 4.6.3.1 Initial bycatch reduction technology selection reports have been produced by the Applicant to provide an overview of the results ([G5.13 Bycatch Reduction Implementation Study 2021/2022 Summary](#)). The bycatch reduction technology selection phase was undertaken during 2021/2022 (commenced November 2021). Further reporting is expected to be available summer 2023. Technical update reports will be developed throughout the project lifetime at a frequency and discussed with OOEG members. These technical update reports will include a description of number of vessels using the technology, locations, duration of

use and results of any bycatch monitoring.

4.7 Outline Timeline

- 4.7.1.1 The activities required to carry out the actions set out above (and will be outlined in the GRCIMP) are well understood due to a strong relationship between the Applicant and the commercial fishing industry.
- 4.7.1.2 The Applicant has undertaken the bycatch reduction technology selection phase throughout 2021/2022 (see timescales within the Bycatch Roadmap (Revision 4 of **B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap** updated at Deadline 5)). The measure could be implemented relatively quickly following consent decision and will be in place prior to operation of the wind turbine generators.
- 4.7.1.3 The Policy paper 'British Energy Security Strategy'¹³ (BESS) published by BEIS in April 2022 recognises the even greater need for rapid development of offshore wind farms committing to 'cut the process time by over half' and 'helping to speed up delivery timelines'.
- 4.7.1.4 The GRCIMP will be supplied to the Secretary of State prior to the commencement of any wind turbine construction, and that this plan must be approved by the Secretary of State in consultation with relevant key stakeholders before the commencement of any wind turbine generator.

5 Resilience Measures – Fish Habitat Enhancement and Prey Resource

5.1 Introduction

- 5.1.1.1 Fish habitat restoration is proposed as a resilience measure to support the primary compensation measures for kittiwake, gannet guillemot and razorbill. The habitat restored (namely, seagrass) will support a number of fish species upon which kittiwake, gannet, guillemot and razorbill (as well as other seabird species) target as prey resource, therefore, this measure serves as a more indirect means to offer resilience to the guillemot and razorbill populations within the targeted area(s). This resilience measure is feasible and can be secured.
- 5.1.1.2 The Applicant has undertaken an extensive review of the evidence base supporting the use of this measure. The results of this review are presented in the accompanying Fish Habitat Enhancement Evidence Report **B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198)**. The Evidence Report covered utilisation of seagrass habitats by key prey fish species associated with guillemot, gannet, razorbill and kittiwake and assessed how enhancing forage fish species may increase seabird prey resource. It highlights the importance of seagrass habitat and provides evidence of seagrass meadows functioning as a nursery for juvenile forage fish species, the importance of this habitat for prey fish species for the four seabirds noted above and seagrass habitat restoration methodology.
- 5.1.1.3 This section should also be read alongside the fish habitat enhancement roadmap (Revision 4 of **B2.8.6 Compensation measures for FFC SPA: Fish Habitat Enhancement: Roadmap** (updated revision submitted at Deadline 5)) which sets out the next steps that will be undertaken should this measure be required.

¹³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069969/british-energy-security-strategy-web-accessible.pdf

5.2 Seagrass Restoration Projects

- 5.2.1.1 Seagrass restoration projects have been undertaken for over 50 years (MMO, 2019). For example, in Chesapeake Bay in the US, 3000 hectares of seagrass have been restored since the first survey in 1984 from once lifeless habitats, with rapid recovery of their ecosystem services now being observed (Orth et al. 2020). The restored seagrass meadows in Chesapeake Bay have recorded rapidly increasing ecosystem service provision from maturing restored seagrass meadows that have become indistinguishable from natural meadows (Orth et al. 2020).
- 5.2.1.2 In recent years, a number of seagrass restoration projects have been undertaken in the UK. Project Seagrass and Swansea University led the UK's first major restoration project in Dale in West Wales. Several organisations are undertaking research and trials to expand or restore seagrass habitat, with the Yorkshire Wildlife Trust aiming to expand the remaining 20 ha of seagrass at Spurn Point Nature Reserve. As part of this restoration work, the Yorkshire Wildlife Trust are undertaking trials to discover the optimal conditions for gathering and germinating seagrass seeds (Yorkshire Wildlife Trust, 2021).
- 5.2.1.3 In Plymouth Sound and the Solent the largest restoration project began in April 2021, a partnership project led by Ocean Conservation Trust (OCT) and involving Natural England, and numerous other stakeholders and volunteers (OCT, 2021). The project aims to plant seagrass bags across a total of 8 ha of seagrass meadows – 4 ha in Plymouth Sound and 4 ha in the Solent Maritime Special Area of Conservation (SAC). By planting seagrass, the project hopes to create more seagrass meadows which provide homes for juvenile fish and protected creatures like seahorses and stalked jellyfish (OCT, 2021).
- 5.2.1.4 The Applicant is exploring opportunities to expand an existing seagrass restoration project that is already underway that could add resilience to the primary compensation measures. The site selection process has identified the Humber Estuary as the most suitable location (illustrated in [Figure 1](#) and has already completed the restoration of 2 hectares of seagrass.

5.3 Seagrass Restoration Techniques

- 5.3.1.1 Seagrass restoration has been formally conducted for over 50 years and the means of doing this can principally be split into two major techniques:
- replanting; and
 - reseeding.
- 5.3.1.2 Both techniques have their relative merits and have exhibited varying levels of success. Reseeding and replanting techniques have sometimes been used together. Using seeds possibly in conjunction with adult plants, may in some instances prove more effective (van Katwijk et al. 2016). A broad overview of the literature illustrates that although a lot is now known about seagrass restoration, there are research gaps and as a result the success rate of restoration projects can vary, demonstrating that it is vital that studies are undertaken to assess the feasibility and site selection and ensure the efficacy of the measure (Unsworth and Butterworth, 2021).
- 5.3.1.3 The use of reseeding generally relates to the collection and targeted redistribution (and sometimes processing) of wild seed. Adult shoot replanting normally involves harvesting plants from an existing meadow and transplanting them to the restoration site. The reproductive fronds of wild seed is collected by hand by SCUBA divers. The seeds collected

by recent projects have obtained permits/consent from Natural England and Natural Resources Wales. Recent reports from the Environment Agency highlight the need for seagrass restoration to increasingly depend upon nursery grown propagules.

- 5.3.1.4 In most cases, shoot planting involves some means of anchoring the shoots to the bottom until the roots can take hold (root into the bottom). Replanting uses either labour intensive diving techniques or various mechanistic approaches to planting various sizes and ages of seagrass plants into new localities. Planting of seedlings in the UK is typically undertaken by a team of divers who are transported to the site by boat. Seeds can also be directly deployed from the boat and often hessian bags are used to help anchor the seeds in place during germination. It is expected that up to two vessels would be required for the seagrass restoration at each location.
- 5.3.1.5 Seagrass restoration requires consideration of a range of factors necessary to make it a success. A recent review of the success of restoration projects globally found that success relates to the severity of the habitat degradation (van Katwijk *et al.* 2016). Seeds, adult plants and sods are not significantly different, although seedlings show lower success rates. A short distance to the donor site is also related to success.
- 5.3.1.6 Some seagrass restoration projects particularly the trials of small/medium sized projects have funding secured. The Applicant has looked to fund additional seagrass restoration that does not currently have funding secured and therefore provide additional benefit rather than contribute to projects that are part of normal practice and site/habitat management of the designated sites. Evidence gathering by the Applicant is ongoing and discussions with stakeholders on restoration projects and techniques is continuing. However, currently all types of restoration methods are being considered and may be combined using the best techniques at the time of restoration for the greatest success.

5.4 Location

- 5.4.1.1 The Applicant has commenced seagrass restoration efforts with a trial scheme at Spurn Point in the Humber Estuary with support from the Yorkshire Wildlife Trust (YWT). The trial seagrass restoration planting has determined the success at a small scale, prior to expanding the scheme to 30 hectares which will commence following DCO consent. To date, the YWT has planted two hectares of seagrass for Hornsea Four and a further two hectares will commence in 2022. Surveys are being undertaken by the University of Hull to demonstrate the connectivity of seagrass in the Humber Estuary with guillemot and razorbill prey found in the North Sea.
- 5.4.1.2 Exploration of potential broad areas for seagrass restoration if needed for adaptive management is ongoing. The main areas that are being considered consistently support all of the target seabird species and provide options for seagrass restoration as well as supporting other compensation measures, therefore increasing the resilience of the measures. Ocean Ecology Limited (OEL) and Swansea University (SU) are supporting the Applicant by conducting this wider study for seagrass restoration. OEL and SU will provide a detailed site selection assessment which will result in a shortlist of potential sites that are not only suitable for restoration but will also provide suitable resilience to the wider package of compensation measures, if required for adaptive management.

5.5 Implementation, Operation, Monitoring and Adaptive Management

- 5.5.1.1 Prior to any large-scale seagrass restoration commencing, detailed implementation studies

have been undertaken to assess the physical parameters for seagrass to be restored and undertake further stakeholder engagement. The Applicant recognises the need for implementation studies to consider site selection and methodology to increase the likelihood of a successful restoration programme and efficacy of the compensation measure. Factors that have been considered prior to large-scale restoration efforts being initiated to ensure the viability of seagrass restoration included looking for a site:

- being sheltered from wave action;
- with suitable topographical and hydromorphological conditions including sedimentation rates;
- sufficient nutrients and available light;
- good water quality; and
- avoid sites with activities that could cause significant physical disturbance.

5.5.1.2 These factors would also be considered for any site required for adaptive management. For an adaptive management site, surveys may be required to establish the levels of activity at the potential locations.

5.5.1.3 The levels of activity and any potential risks to seagrass restoration were fully understood by YWT and considered in the site selection process. The site was chosen due to the minimal risks and activity in the seagrass bed and surrounding seabed and the ability to manage activities due to the ownership of the seabed by YWT and protective byelaw for seagrass. Planting seagrass at sites previously known to support seagrass and known to have appropriate conditions for seagrass will likely result in increased biodiversity and ecosystem service provision (Unsworth, 2021). Part of the site selection process to determine the chosen site in the Humber Estuary and for any adaptive management locations evidence of previous seagrass locations is a key consideration (Green *et al.*, 2021). At Spurn Point in the Humber Estuary there is an existing seagrass bed covering approximately 20 hectares with a further 2 hectares recently planted for Hornsea Four, therefore providing confidence in the suitable conditions and considerable scope within the remaining protected area which is currently sparsely or un-colonised.

5.5.1.4 For a new restoration project, physical surveys (e.g. particle size, depth, slope, light, temperature, total suspended solids, redox layer) and biological surveys may be conducted as well as habitat mapping at each site, these could involve the use of camera drops and diver surveys to assess the suitability of the potential locations. When undertaking site selection studies the health and/ or nutrient status of the closest seagrass meadows or patch will be examined. A geomorphological and suspended sediment analysis of the Humber Estuary at Spurn Point has been undertaken by the University of Hull for Hornsea Four. The analysis of the proposed restoration site is considered to be stable and appears suitable for replanting, with minimal identified risk of smothering. Levels of surface chlorophyll also remain stable and do not indicate a risk of algal bloom or eutrophication. The Fish Habitat Enhancement: Implementation Study and Fish Connectivity Survey Summary will provide further details on the analysis at Deadline 6. Fish nursery and bird surveys have already commenced at the Humber Estuary for the Hornsea Four seagrass restoration project.

5.5.1.5 It may be necessary, especially with the potential scale of restoration, that for adaptive management potential sites a series of surveys would be needed to identify potential seagrass meadows for future seed collections. This would be conducted in consultation with

Natural England and other stakeholders. When planning the restoration project the focus would be on facilitating natural recovery through alleviating recruitment limitation. The seed collection and planting within the Humber Estuary is consented by Natural England. YWT have been working with Natural England, and have agreed a suite of rolling permissions and consents for the seagrass restoration and accompanying survey works, including seagrass seed collection, two methods of seagrass planting, and benthic, environmental and fisheries surveys.

- 5.5.1.6 The Applicant has considered the most appropriate scale for any resilience measure. The Applicant recognises the importance of encouraging long-term survival by promoting self-facilitation through implementation at a large-enough scale. The Applicant will ensure that significant contingency, which may include reseeded/replanting, is built into the measure to provide the necessary confidence that it will have sufficient resilience, offset the impact and efficacy as a compensation measure. The Applicant has committed to restore 30 hectares of seagrass following DCO consent, in addition to the 4 hectares being planted as part of the implementation studies in the Humber Estuary (2 hectares of seagrass have already been planted at Spurn Point).
- 5.5.1.7 Engagement with statutory and non-statutory bodies and local stakeholders and landowners will be undertaken to share and discuss our ambitions, plans and to ensure the success of the measures. The Applicant is working with academics and organisations with experience of previous restoration projects in order to ensure that activities build on the outcomes of best practice and lessons learnt.
- 5.5.1.8 For any adaptive management locations, following site suitability surveys, a site selection process (potentially using a decision matrix) will be used to select the optimal site(s) for restoration. Environmental baseline surveys of the site(s) will be undertaken so that change over time can be assessed accordingly. Restoration of the seagrass using replanting and/ or reseeded methods will be undertaken following the methodology devised through engagement with academics and stakeholders. A pilot trial planting scheme is likely to be undertaken particularly for any new restoration location. Following the implementation trials to gather further evidence on the efficacy of the seagrass restoration, the site and methods will be selected to take forward.
- 5.5.1.9 There are several seagrass restoration projects being considered by a number of organisations in the UK and it may be that a project has already undertaken the required site selection and trials and is looking for the resource to undertake a larger scale scheme.
- 5.5.1.10 To date, the YWT has planted on behalf of the Applicant 2 hectares of seagrass within the Humber Estuary. The Applicant funded the seed collection in 2021 in order to facilitate this trial scheme in the Humber.
- 5.5.1.11 The Applicant is confident that the measures extensive large-scale seagrass restoration (up to a total of 30 ha) will provide resilience to the measures and compensate as part of a suite of measures for Hornsea Four. Implementation of the trial seagrass restoration project commenced prior to obtaining DCO consent, to allow for monitoring of the trial scheme and to enable further research studies to commence in order to fill some of the evidence gaps highlighted in the **B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198)** and increase confidence in the contribution of seagrass restoration as part of the compensation package for Hornsea Four. All necessary permissions and consents have been obtained for the trial scheme and will be obtained for any further larger-scale restoration efforts.

5.5.1.12 It is recognised that there are knowledge gaps on the specific linkages between seagrass in the UK and non-grazing seabirds and the level of the role of seagrass supporting forage fish for seabirds such as razorbill, guillemot, gannet and kittiwake. Nonetheless, there is clear evidence of the ecological benefits of seagrass and for prey species. Whilst the broad understanding of the links between seagrass meadows and fisheries are well understood (Kritzer et al. 2016; Unsworth et al. 2019), there is currently limited evidence for this role at a UK level, with most data collected from only a handful of sites (Bertelli and Unsworth 2014; Peters et al. 2015). Understanding about temporal and spatial variability is also lacking (Unsworth and Butterworth, 2021). Whilst it is known that forage fish species clupeids, gadoids and sand eels all utilise UK seagrass meadows at periods of the life cycle the nature of this role hasn't been quantified (Unsworth and Butterworth, 2021). The Evidence Report (**B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198)**) sets out the ecological evidence for fish habitat enhancement as a compensation measure in further detail.

5.5.1.13 A key component of the fish habitat enhancement compensation measure will be research, to gather evidence to contribute towards filling these knowledge gaps. The Applicant has identified a number of research topics to be undertaken (in addition to the implementation studies). As part of the restoration efforts in the Humber Estuary the University of Hull is undertaking several studies including:

- A fish nursery assessment; and
- Connectivity surveys, which will include fish samples in the Humber and near Hornsea Four and the wider North Sea and Stable Isotope Analysis to determine connectivity.

5.5.1.14 These research topics will be explored in greater detail and a research programme will be devised to support of the measures with many of these projects starting in 2022.

5.5.1.15 Monitoring of the restored seagrass will be essential to demonstrate the efficacy of the compensation measure and if required, the seagrass meadow will be monitored throughout the operational lifespan of Hornsea Four. The exact method of monitoring and frequency will be decided based upon further evidence gathering and discussion with restoration experts and stakeholders. A monitoring programme will be developed and at key stages the results of the enhancement will be shared to improve the knowledge and evidence for seagrass restoration.

5.5.1.16 Adaptive management is an iterative process which combines management measures and subsequent monitoring with the aim of improving effectiveness whilst also updating knowledge and improving decision making over time. Adaptive management will be an important component of the resilience measure and will be used as a method to address unforeseen issues or deviations from expected time scales (i.e. additional infill planting required).

5.6 Summary of Fish Habitat Enhancement Next Steps

5.6.1.1 In summary, the Applicant has commenced seagrass restoration in the Humber Estuary with support from the YWT and the University of Hull. To date, 2 hectares of seagrass have been planted within the Humber Estuary. Further implementation studies are being conducted by OEL and SU to establish how the resilience measure could be continued and expanded to establish a large-scale restoration site or sites in the Humber Estuary or at other sites within

the UK, if required for adaptive management.

- 5.6.1.2 The restoration of seagrass is considered an effective, feasible and securable measure that can be implemented prior to the impact occurring and sustainable for the life-time of the project. In designing this compensation measure the Applicant has consulted and worked with academics, Natural England, JNCC, the RSPB, The Wildlife Trust, other statutory bodies, and other relevant stakeholders to ensure this compensation measure is both robust and deliverable.

6 Draft DCO Wording

Commentary:

Article 40 of the draft DCO currently gives effect to Schedule 16 of the draft DCO:

Compensation provisions

40. Schedule 16 (compensation to protect the coherence of the national site network) has effect.

Part 1 and Part 2 of Schedule 16 makes provision for compensatory measures for kittiwake.

Part 3 of Schedule 16 makes provision for a contribution to the Marine Recovery Fund.

Part 4 of Schedule 16 makes provision for fish habitat enhancement.

If necessary, the Secretary of State could amend Schedule 16 to secure compensatory measures for gannet, guillemot and razorbill, in accordance with the draft provisions set out below.

For the avoidance of doubt, no amendment would be required to article 40, which as noted above already gives effect to the entirety of Schedule 16.

Schedule 16

COMPENSATION TO PROTECT THE COHERENCE OF THE NATIONAL SITE NETWORK

Part 1

OFFSHORE ORNITHOLOGY ENGAGEMENT GROUP

1. In this Schedule—

“Defra” means the Department for the Environment, Food and Rural Affairs.

“the FFC” means the site designated as the Flamborough and Filey Coast Special protection Area; “GCIMP” means the gannet compensation implementation and monitoring plan for the delivery of measures to compensate for the predicted loss of adult gannet from the FFC as a result of the authorised development;

“GRCIMP” means guillemot and razorbill compensation implementation and monitoring plan for the delivery of measures to compensate for the predicted loss of adult guillemot and razorbill from the FFC as a result of the authorised development;

"KCIMP" means the kittiwake compensation implementation and monitoring plan for the delivery of measures to compensate for the predicted loss of adult kittiwakes from the FFC as a result of the authorised development;

"the gannet compensation plan" means the document certified as the gannet compensation plan by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents, etc);

"the guillemot and razorbill compensation plan" means the document certified as the guillemot and razorbill compensation plan by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents, etc);

"the Hornsea Four Offshore Ornithology Engagement Group" or "H4 OOEG" means the group that will assist, through consultation, the undertaker in the delivery of the compensation measures identified in the kittiwake compensation plan, the gannet compensation plan and the guillemot and razorbill compensation plan;

"the kittiwake compensation plan" means the document certified as the kittiwake compensation plan by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents, etc.);

2. "the Marine Recovery Fund" means the fund operated by Defra pursuant to the Offshore Wind Environmental Improvement Package of the British Energy Security Strategy (April 2022) for the implementation of strategic compensation or any equivalent fund established by a Government body for that purpose.

"the offshore compensation measures" means, as the context requires, bycatch reduction and/or the offshore nesting structure(s); and "the onshore compensation measure" means, as the context requires, predator eradication and/or the onshore nesting structure(s).

3. Work Nos. 1, 2, 3, 4 and 5 together with any associated development offshore may not be commenced until a plan for the work of the H4 OOEG has been submitted to and approved by the Secretary of State, such plan to include—
 - terms of reference of the H4 OOEG;
 - details of the membership of the H4 OOEG which must include—
 - the MMO and the relevant statutory nature conservation body as core members for the offshore compensation measures;
 - the relevant local planning authority and statutory nature conservation body as core members for the onshore compensation measures;
 - the RSPB and The Wildlife Trust as advisory members, for both the onshore compensation measures and/or the offshore compensation measures subject to their area of expertise;
 - details of the proposed schedule of meetings, timetable for preparation of the KCIMP, the GCIMP and the GRCIMP and reporting and review periods;
 - the dispute resolution mechanism and confidentiality provisions; and
4. the scope of work to be limited to the topics for discussion as identified by the appointed chair to include in relation to the compensation measure, monitoring and adaptive management.

Part 2

KITTIWAKE COMPENSATION

1. Following consultation with the H4 OOEG, the KCIMP must be submitted to the Secretary of State for approval in consultation with the MMO and relevant statutory nature conservation body for the offshore compensation measure (if required), and with the relevant local planning authority and relevant statutory nature conservation body for the onshore compensation

measure (if required). The KCIMP must be based on the strategy for kittiwake compensation set out in the kittiwake compensation plan and include—

- a. details of location where the compensation measure will be delivered, and in the event an onshore structure is required, details of landowner agreement(s) and in the event an offshore structure is required, details of any relevant seabed agreement(s);
 - b. details of the design of the artificial nesting structure; including the projected number of nests that will be accommodated on the structure, and how risks from avian or mammalian predation and for an onshore nesting structure how unauthorised human access will be mitigated;
 - c. an implementation timetable for delivery of the artificial nesting structure, such timetable to ensure that the structure is in place to allow for at least three full kittiwake breeding seasons prior to operation of any turbine forming part of the authorised development. For the purposes of this paragraph each breeding season is assumed to have commenced on 1st April in each year and ended on 31st August;
 - d. details of the maintenance schedule for the artificial nesting structure;
 - e. details for the proposed ongoing monitoring of the measure including—
 - i. survey methods;
 - ii. survey programmes; and
 - iii. colony and productivity counts;
 - f. recording of H4 OOEG consultations;
 - g. details of any adaptive management measures, with details of the factors used to trigger any such measures; and
 - h. provision for reporting to the Secretary of State, to include details of the use of the structure by breeding kittiwake to identify barriers to success and target any adaptive management measures.
 - i. provision for the option to be exercised at the sole discretion of the undertaker to pay a contribution (in addition to the sum stipulated in Part 3 of this Schedule) to the Marine Recovery Fund wholly or partly in substitution for the onshore compensation measure and/or the offshore compensation measure or as an adaptive management measure for the purposes of paragraph 1.g. of this Part of this Schedule. The sum of the contribution to be agreed between the undertaker and Defra in consultation with the OOEG and included in the KCIMP.
2. Paragraphs 3, 4 and 5 of this Part of this Schedule shall not apply to the extent that a contribution to the Marine Recovery Fund has been elected in substitution for the onshore compensation measure and/or the offshore compensation measure for the purposes of paragraph 1(i) of this Part of this Schedule.
 3. The undertaker must construct the artificial nesting structure as set out in the KCIMP approved by the Secretary of State.
 4. The undertaker must notify the Secretary of State of completion of construction of the artificial nesting structure as set out in the KCIMP.
 5. The artificial nesting structure must not be decommissioned without prior written approval of the Secretary of State in consultation with relevant statutory nature conservation body.
 6. The KCIMP approved under this Schedule includes any amendments that may subsequently be approved in writing by the Secretary of State. Any amendments to or variations of the approved KCIMP must be in accordance with the principles set out in the kittiwake compensation plan and may only be approved where it has been demonstrated to the satisfaction of the Secretary of State that it is unlikely to give rise to any materially new or materially different environmental effects from those considered in the kittiwake compensation plan.

Part 3

CONTRIBUTION TO MARINE RECOVERY FUND

1. No turbine forming part of the authorised development may begin operation until the undertaker has paid the sum of £500,000 (five hundred thousand pounds) to the Marine Recovery Fund.

PART 4

FISH HABITAT ENHANCEMENT

1. No turbine forming part of the authorised development may begin operation until arrangements for the implementation of fish habitat enhancement measures have been put in place in accordance with the principles set out in the KCIMP, the GCIMP and the GRCIMP.

PART 5

GANNET COMPENSATION

2. Following consultation with the H4 OoEG, the GCIMP must be submitted to the Secretary of State for approval in consultation with the MMO and relevant statutory nature conservation body for the offshore compensation measure(s) (if required), and with the relevant local planning authority and relevant statutory nature conservation body for the onshore compensation measure (if required). The GCIMP must be based on the strategy for gannet compensation set out in the gannet compensation plan and must include:
 - a. for the artificial nesting structure measure:
 - i. details of the location where compensation measure will be delivered, and in the event an onshore structure is required, details of landowner agreement(s) and in the event an offshore structure is required, details of any relevant seabed agreement(s);
 - ii. details of the design of the artificial nesting structure; including the projected number of nests that will be accommodated on the structure, and how risks from avian or mammalian predation and for an onshore nesting structure how unauthorised human access will be mitigated;
 - iii. an implementation timetable for delivery of the artificial nesting structure, such timetable to ensure that the structure is in place to allow for at least three full gannet breeding seasons prior to operation of any turbine forming part of the authorised development. For the purposes of this paragraph each breeding season is assumed to have commenced on 1st April in each year and ended on 31st August
 - iv. details of the maintenance schedule for the artificial nesting structure;
 - v. details for the proposed ongoing monitoring of the measure including
 - vi. 1. survey methods;
 - vii. 2. survey programmes; and
 - viii. 3. colony and productivity counts;
 - ix. recording of H4 OoEG consultations;
 - x. details of any adaptive management measures, with details of the factors used to trigger any such measures; and
 - xi. provision for reporting to the Secretary of State, to include details of the use of the structure by breeding gannet to identify barriers to success and target any adaptive management measures;

- xii. provision for the option to be exercised at the sole discretion of the undertaker to pay a contribution (in addition to the sum stipulated in Part 3 of this Schedule) to the Marine Recovery Fund wholly or partly in substitution for the onshore and/or offshore artificial nesting structures or as an adaptive management measure for the purposes of paragraph 1.a.vii of this Part of this Schedule. The sum of the contribution to be agreed between the undertaker and Defra in consultation with OoEG and included in the GCIMP.
 - b. for the bycatch reduction measure:
 - i. details of relevant technology supply agreements and arrangements with fishers to use the bycatch reduction technology that will be or have been secured by the undertaker;
 - ii. an implementation timetable for provision of the bycatch reduction measure, such timetable to ensure that contract(s) are entered into with fishers for the provision and use of bycatch reduction technology no later than one year prior to the operation of any turbine forming part of the authorised development;
 - iii. details for the proposed ongoing monitoring of the measure including collection of data from participating fishers;
 - iv. recording of H4 OoEG consultations;
 - v. details of any adaptive management measures and details of the factors used to trigger any such measures; and
 - vi. provision for annual reporting to the Secretary of State, to identify barriers to success and target any adaptive management measures.
 - vii. provision for the option to be exercised at the sole discretion of the undertaker to pay a contribution (in addition to the sum stipulated in Part 3 of this Schedule) to the Marine Recovery Fund wholly or partly in substitution for the bycatch measures or as an adaptive management measure for the purposes of paragraph 1.b.v of this Part of this Schedule. The sum of the contribution to be agreed between the undertaker and Defra in consultation with OoEG and included in the GCIMP.
- 3. Paragraphs 3, 4 and 5 of this Part of this Schedule shall not apply to the extent that a contribution to the Marine Recovery Fund has been elected in substitution for the onshore compensation measure and/or the offshore compensation measure and/or the bycatch compensation measure for the purposes of paragraphs 1.a.ix and 1.b.vii of this Part of this Schedule.
- 4. The undertaker must construct the artificial nesting structure and enter into contract(s) with fishers for the provision and use of bycatch reduction technology as set out in the GCIMP approved by the Secretary of State.
- 5. The undertaker must notify the Secretary of State of completion of construction of the artificial nesting structure and the entering into contract(s) with fishers for the provision and use of bycatch reduction technology as set out in the GCIMP.
- 6. The artificial nesting structure must not be decommissioned without prior written approval of the Secretary of State in consultation with relevant statutory nature conservation body.
- 7. The GCIMP approved under this Schedule includes any amendments that may subsequently be approved in writing by the Secretary of State. Any amendments to or variations of the approved GCIMP must be in accordance with the principles set out in the gannet compensation plan and may only be approved where it has been demonstrated to the satisfaction of the Secretary of State that it is unlikely to give rise to any materially new or materially different environmental effects from those considered in the gannet compensation plan.

PART 6

GUILLEMOT AND RAZORBILL COMPENSATION

1. Following consultation with the H4 OoEG, the GRCIMP must be submitted to the Secretary of State for approval in consultation with the MMO and relevant statutory nature conservation body for the offshore compensation measure, and with the relevant statutory nature conservation body and the relevant local planning authority and relevant conservation trusts for the onshore compensation measure. The GRCIMP must be based on the strategy for guillemot and razorbill compensation set out in the guillemot and razorbill compensation plan and include:
 - a. for the predator eradication measure:
 - i. details of the location(s) where the compensation measure will be delivered;
 - ii. details of how any necessary access rights, licences and approvals have or will be obtained and any biosecurity measures will be or have been secured;
 - iii. an implementation timetable for delivery of the predator eradication measure, such timetable to ensure that the predator eradication method has commenced no later than two years prior to operation of any turbine forming part of the authorised development;
 - iv. details for the proposed ongoing monitoring of the measure including:
 - v. 1. survey methods;
 - vi. 2. survey programmes;
 - vii. 3. productivity rates;
 - viii. 4. breeding population; and
 - ix. 5. distribution of breeding birds;
 - x. recording of H4 OoEG consultations;
 - xi. details of any adaptive management measures, with details of the factors used to trigger any such measures; and
 - xii. provision for reporting to the Secretary of State, to include details of the use of the location(s) by breeding guillemot and razorbill to identify barriers to success and target any adaptive management measures.
 - xiii. provision for the option to be exercised at the sole discretion of the undertaker to pay a contribution (in addition to the sum stipulated in Part 3 of this Schedule) to the Marine Recovery Fund wholly or partly in substitution for the predator eradication measures or as an adaptive management measure for the purposes of paragraph 1.a.vi. of this Part of this Schedule] The sum of the contribution to be agreed between the undertaker and Defra in consultation with OoEG and included in the GRCIMP.
 - b. for the bycatch reduction measure:
 - i. details of relevant technology supply agreements and arrangements with fishers to use the bycatch reduction technology that will be or have been secured by the undertaker;
 - ii. an implementation timetable for provision of the bycatch reduction measure, such timetable to ensure that contract(s) are entered into with fishers for the provision and use of bycatch reduction technology no later than one year prior to the operation of any turbine forming part of the authorised development;
 - iii. details for the proposed ongoing monitoring of the measure including collection of data from participating fishers;
 - iv. recording of H4 OoEG consultations;
 - v. details of any adaptive management measures and details of the factors used to trigger any such measures; and
 - vi. provision for annual reporting to the Secretary of State, to identify barriers to success and target the adaptive management measures.

- vii. provision for the option to be exercised at the sole discretion of the undertaker to pay a contribution (in addition to the sum stipulated in Part 3 of this Schedule) to the Marine Recovery Fund wholly or partly in substitution for the bycatch eradication measures or as an adaptive management measure for the purposes of paragraph 1.b.vi of this Part of this Schedule] The sum of the contribution to be agreed between the undertaker and Defra in consultation with OOEG and included in the GRCIMP.
2. Paragraphs 3 and 4 of this Part of this Schedule shall not apply to the extent that a contribution to the Marine Recovery Fund has been elected in substitution for the predator eradication measure and/or the bycatch compensation measure for the purposes of paragraphs 1.a.viii and 1.b.vii of this Part of this Schedule.
3. The undertaker must carry out the predator eradication method and enter into contract(s) with fishers for the provision and use of bycatch reduction technology as set out in the GRCIMP approved by the Secretary of State.
4. The undertaker must notify the Secretary of State of completion of the predator eradication method and entering into contract(s) with fishers for the provision and use of bycatch reduction technology set out in the GRCIMP.
5. The GRCIMP approved under this Schedule includes any amendments that may subsequently be approved in writing by the Secretary of State. Any amendments to or variations of the approved GRCIMP must be in accordance with the principles set out in the guillemot and razorbill compensation plan and may only be approved where it has been demonstrated to the satisfaction of the Secretary of State that it is unlikely to give rise to any materially new or materially different environmental effects from those considered in the guillemot and razorbill compensation plan.

7 Funding

- 7.1.1.1 The Applicant has identified the costs associated with the development, implementation and ongoing monitoring of the proposed measures. These costs have been included within a detailed Funding Statement (**B2.10: The Without Prejudice Derogation Funding Statement (APP-202)**). This statement is supplemental to the Funding Statement submitted as part of the suite of Application documents (**Volume E.1.1 Funding Statement (REP2-018)**). The Without Prejudice Derogation Funding Statement outlines the overall project cost based on the capital expenditure and operational expenditure assumptions in the "Review of Renewable Electricity Generation Cost and Technical Assumptions" (DECC, 2016). The Without Prejudice Derogation Funding Statement also details the corporate structure and a robust explanation to allow the Secretary of State to conclude that the necessary funding to deliver the measures can be secured.

8 Conclusion

- 8.1.1.1 This document sets out the Compensation Plan for common guillemot *Uria aalge* (guillemot) and razorbill *Alca torda* associated with the Flamborough and Filey Coast (FFC) Special Protection Area (SPA). Collectively it has been termed the Guillemot and Razorbill Compensation Plan. It has been developed in support of Hornsea Four should the Secretary of State disagree with the conclusions of the Applicant's RIAA in relation to the impact and find that adverse effects on the integrity of the FFC SPA cannot be ruled out.
 - 8.1.1.2 A suite of compensation measures are proposed for guillemot and razorbill which are outlined below in **Table 1**.
 - 8.1.1.3 There are two potential primary compensation measures being proposed. The objective of the first is to attain removal of (invasive) predators for a chosen location and monitor the response of guillemot and/ or razorbill population numbers as a consequence of the removal

of this pressure. The second measure has the objective of reducing bycatch at a chosen fishery or fisheries hence reducing the number of direct mortalities per annum. Finally, as part of the package of measures to support guillemot and razorbill (and as outlined within the Kittiwake Compensation Plan and Gannet Compensation Plan as well), fish habitat enhancement is being undertaken within the Humber Estuary as a resilience measure. The habitat restored (namely, seagrass) will support a number of fish species upon which guillemot and razorbill (and seabirds more generally including kittiwake and gannet) target as prey resource, therefore, this measure serves to offer resilience to the guillemot and razorbill populations within the targeted area.

- 8.1.1.4 Hornsea Four are confident that each of the measures on their own is securable, deliverable and capable of maintaining the coherence of the national site network. The inclusion of a suite of measures provides stakeholders with additional comfort on the level of compensation that can be provided as does the inclusion of the option to discharge the compensation requirements through the delivery of strategic compensation. There is clear evidence to support the suite of measures. The Applicant has presented detailed reviews of the evidence base supporting each of the compensation measures which can be found in the following documents: [B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#); [B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence \(APP-196\)](#); and [B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence \(APP-198\)](#)).
- 8.1.1.5 In terms of next steps, for these compensation and resilience measures, a Roadmap document has been produced for each measure which details the process that will be undertaken for delivery of the measure if required. These roadmaps accompany the DCO application and are: Revision 4 of [B2.8.2 Compensation measures for FFC SPA: Bycatch Reduction: Roadmap](#) (updated at Deadline 5), Revision 4 of [B.2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) (updated at Deadline 5) and Revision 4 of [B2.8.6 Compensation measures for FFC SPA: Fish Habitat Enhancement: Roadmap](#) (updated at Deadline 5). The compensation measures are viable, effective, feasible and can be secured and delivered to successfully compensate for the potential impacts of Hornsea Four.

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