Hornsea Project Four: Derogation Information

FFC SPA: Kittiwake Compensation Plan

Deadline 7, Date: 10 August 2022
Document reference: B2.7
Revision 03

Prepared	GoBe Consultants Ltd, August 2022
Checked	Sarah Randall Orsted, August 2022
Accepted	Francesca De Vita Orsted, August 2022
Approved	Julian Carolan, Orsted, August 2022

B2.7
Ver. C

Revision Summary				
Rev	*Date*	*Prepared by*	*Checked by*	*Approved by*
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
03	10/08/2022	GoBe Consultants Ltd, August	Dr Sarah Randall, Orsted, August 2022	Dr Julian Carolan, Orsted, August 2022

Revision Change Log			
Rev	*Page*	*Section*	*Description*
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	10	1.3	Updated Figure 1 for the areas of search for the compensation measures.
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.
03	Updated throughout	Updated throughout	Correcting formatting issues.
03	12	1	Removal of sentence regarding the chair of the OOEG.
	Updated throughout	Updated throughout	Addition of recent survey and summary documents.
03	Updated throughout	Updated throughout	Removal of gannet to align with update project position.
03	Updated throughout	Updated throughout	Updates to reflect responses at Deadline 6 and ISH.
03	31-35	5	Updated DCO wording.

Table of Contents

List of Tables

List of Figures

Glossary

Term	Definition
Black-legged kittiwake biogeographic population	The east Atlantic breeding population of kittiwake which 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.
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).
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 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.
Hornsea Project Four Offshore Wind Farm	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.
Offshore Ornithology Engagement Group (OOEG)	The Hornsea Four Offshore Ornithology Engagement Group means the group that will assist, through consultation with the undertaker in relation to the delivery of each compensation measures as identified in the kittiwake 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, and the guillemot and razorbill compensation plan.
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

Term	Definition
	(Amendment) (EU Exit) Regulations 2019 these sites formed part of the EU ecological network knows as "Natura 2000".
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).
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 (**B2.2: Report to Inform Appropriate Assessment Part 1** (**REP5-012**), **Part 2 (REP2-005), Part 3 (AS-013), Part 4 (REP1-012), Part 5-12 (APP-171-178)**).
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.

Acronyms

Acronym	Definition
AEOI	Adverse Effect on Integrity
cSAC	Candidate Special Area of Conservation
DCO	Development Consent Order
FFC	Flamborough and Filey Coast
KCIMP	Kittiwake Compensation Implementation and Monitoring Plan
HRA	Habitats Regulations Assessment
MMO	Marine Management 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 **Revision 7 ofA1.4: Project Description** (Deadline 7 submission), 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 km^2 at the Scoping phase of project development. In the spirit of keeping within 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 km^2) to the Preliminary Environmental Information Report (PEIR) boundary (600 km^2), with a further reduction adopted for the Environmental Statement (ES) and DCO application (486 km^2) 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 (AEoI) 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 AEoI on the FFC SPA in combination with other plans and projects. The Applicant maintains its position of no AEoI alone or in combination for all other qualifying species (guillemot, razorbill) 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 plan **B2.7: FFC SPA: Gannet and Kittiwake Compensation Plan (APP-186)**. However, as set out in the Applicant's position paper (**G1.5 Kittiwake AEoI Conclusion (AS-023)**), the Applicant has updated the Report to Inform Appropriate Assessment (RIAA) (**B2.2 Report to Inform Appropriate Assessment Part 1** (**REP5-012**) 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 AEoI on kittiwake at the FFC SPA from Hornsea Four in-combination with other projects.

1.1.1.6 Natural England in their response at Deadline 6 have also confirmed **(REP6-055)** that subject

to resolving some minor discrepancies in the data, they can confirm AEoI can be ruled out alone or in combination for gannet at FFC SPA. The "without prejudice" derogation case has therefore been withdrawn for gannet.

1.1.1.7 This document sets out the Compensation Plan for black-legged kittiwake *Rissa trydactyla* (kittiwake) associated with the Flamborough and Filey Coast (FFC) Special Protection Area (SPA) (termed the Kittiwake Compensation Plan). Specifically, this plan sets out how the compensation measure of artificial nesting, for kittiwake can be secured at the time of DCO being granted. In addition, this plan sets out the resilience measure for kittiwake compensation through fish habitat enhancement. It is important to note at this stage that the site selection, detailed design, monitoring and adaptive management of the proposed compensation and resilience measures would be developed in consultation with the Hornsea Four Offshore Ornithology Engagement Group (OOEG) and outlined in the Kittiwake Compensation, Implementation and Monitoring Plan (KCIMP) for approval by the Secretary of State post-consent. The ongoing site selection and design (**B2.7.5: Compensation measures for FFC SPA Artificial Nesting Site Selection and Design (APP-191)**) considers the preferred location(s) for the artificial nesting measure and the detailed design to ensure the adequacy of design for the scale of compensation required (see **Table 2** of **B2.6: Compensation measures for FFC SPA Overview** (**REP5a-001**).

1.1.1.8 Further details on the precise delivery methodology for the measure would be provided in a KCIMP submitted to the Secretary of State prior to the operation of any wind turbine generator[1]. The KCIMP would be approved by the Secretary of State in consultation with the MMO/local planning authority and Natural England. An outline version of the KCIMP (which details its proposed content) is presented in Revision 3 of **B2.7.6: Outline Kittiwake Compensation Implementation and Monitoring Plan** (Deadline 7 submission).

1.2 Predicted Effects

1.2.1.1 This Kittiwake Compensation Plan relates to the potential collision effect for kittiwake from the operation and maintenance phase of Hornsea Four. The predicted magnitude of this impact on the kittiwake features of the FFC SPA is presented in **Table 2** of **B2.6: Compensation measures for FFC SPA Overview** (**REP5a-001**).

1.2.1.2 The Applicant has undertaken a robust RIAA (**B2.2: Report to Inform Appropriate Assessment (REP5-012, REP2-005, AS-013, REP1-012, and APP-171-APP-178)**) which concluded that based on the available evidence relating to the potential for collision mortality to kittiwake, it does not consider there to be potential for AEoI on the conservation objectives of the FFC SPA either from the project alone or in-combination. Following the Applicant's submission, the Applicant has revisited its conclusion of no potential for an AEoI in respect of the kittiwake feature of the FFC SPA from Hornsea Four in-combination with other plans and concluded that there is potential for an AEoI on kittiwake at the FFC SPA from Hornsea Four in-combination with other projects. The Applicant maintains its position of no AEoI alone or in-combination for all other qualifying species (guillemot and razorbill) of the FFC SPA and for all other European sites.

1.2.1.3 **Table 2** of Revision 2 of **B2.6: Compensation measures for FFC SPA Overview** (**REP5a-001**) presents the species impact levels, compensation numbers, compensation measure ratio and percentage of current breeding population relative to FFC SPA.

[1] "operation of any wind turbine generator" means the first day on which operation of any wind turbine generator is programmed to commence.

1.3 Compensation Measures

1.3.1 Background

1.3.1.1 In the event that the Secretary of State would be unable to reach a conclusion of no adverse effect on the integrity of the FFC SPA for kittiwake, the Applicant has developed a compensation measure that could be applied (by the Secretary of State) to compensate at scalable levels for the predicted collision impact on kittiwake, from Hornsea Four. In light of the Applicant's updated position on kittiwake, the compensation measure is expected to be required by the Secretary of State.

1.3.1.2 The proposed compensation measure for kittiwake (artificial nesting) contains a number of sub-options which are outlined in **Table 1** and are presented in detail in **Sections 3** and **4**. The location of the search area for these measures (as well as the other compensation and resilience measures being proposed for Hornsea Four) is shown in **Figure 1**.

1.3.1.3 The potential collision mortality effect from Hornsea Four for the project alone is predicted to be 23 individuals. It is calculated that approximately 62 additional breeding pairs will be required to compensate for the potential effect (**B2.2: Report to Inform Appropriate Assessment (REP5-012)** and **Table 2** of Revision 2 of **B2.6 Compensation measures for FFC SPA: Overview (REP5a-001)** for further details on the predicted effects and compensation suite). The Applicant is confident that the compensation measure is robust, deliverable and scalable.

1.3.1.4 For example, in relation to the offshore structure the initial indicative topside design (see **Figure 4** in **B2.7.5: Compensation measures for FFC SPA Artificial Nesting Site Selection and Design (APP-191)**) was created to compensate for approximately 500 breeding pairs (anticipated maximum design scenario for nesting kittiwake pairs at time of early topside design). This is in orders of magnitude greater than the compensation levels required for kittiwake presented in **Table 2** of Revision 2 of **B2.6: Compensation measures for FFC SPA Overview** (**REP5a-001**). The refined topside design is scalable to provide nesting habitat for up to approximately 750 kittiwake breeding pairs, as a consequence of the available space on the preferred available offshore structure for repurposing (as illustrated in Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** (updated revisions submitted at Deadline 7)). Furthermore, the inclusion of a resilience measure provides stakeholders with additional comfort on the level of compensation that can be provided.

1.3.1.5 The provision of an offshore artificial nesting structure is proposed as the primary compensation measure. The Applicant's preference is supported by the acquired ecological evidence (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)**) indicating strong efficacy for a repurposed existing offshore structure for artificial nesting. However, if decided by the Secretary of State, the Applicant could provide either a new offshore or a new onshore structure as a compensation measure for kittiwake (see **Section 3**). As with the preferred offshore structure, the onshore structure is also scalable. In addition, as part of the suite of measures to support kittiwake (and as outlined within the Guillemot and Razorbill Plan as well), fish habitat enhancement would also be undertaken at a chosen location. The habitat restored (namely, seagrass) would support a number of fish species upon which kittiwake (and seabirds more generally including guillemot and razorbill) target as prey resource. Therefore, this measure serves as a more indirect means to offer resilience to the kittiwake populations within the targeted area(s). The compensation measures are feasible and can be secured.

1.3.1.6 Figure 1 illustrates the areas of search that are currently being investigated for the location of all the compensation measures that may be required for Hornsea Four.

1.3.1.7 Information is presented in Sections 3 and 4 on a measure-by-measure basis and draws on evidence presented in the associated evidence reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187), B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189), 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.

1.3.2 Strategic Compensation

1.3.2.1 The Applicant has amended the DCO wording in Section 5 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** (**REP5-086**) and set out in the Roadmaps. This drafting has been included as an "option", to provide flexibility as to the means and form of compensation that can be delivered post-consent. The Applicant's package of project-specific compensation measures has not been withdrawn and will remain secured should a contribution to the MRF not be made, or if the MRF is not in place in sufficient time. If the Applicant has elected to pay a contribution to the 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 subject to approval by the Secretary of State. 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 equivalent fund), 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 5).

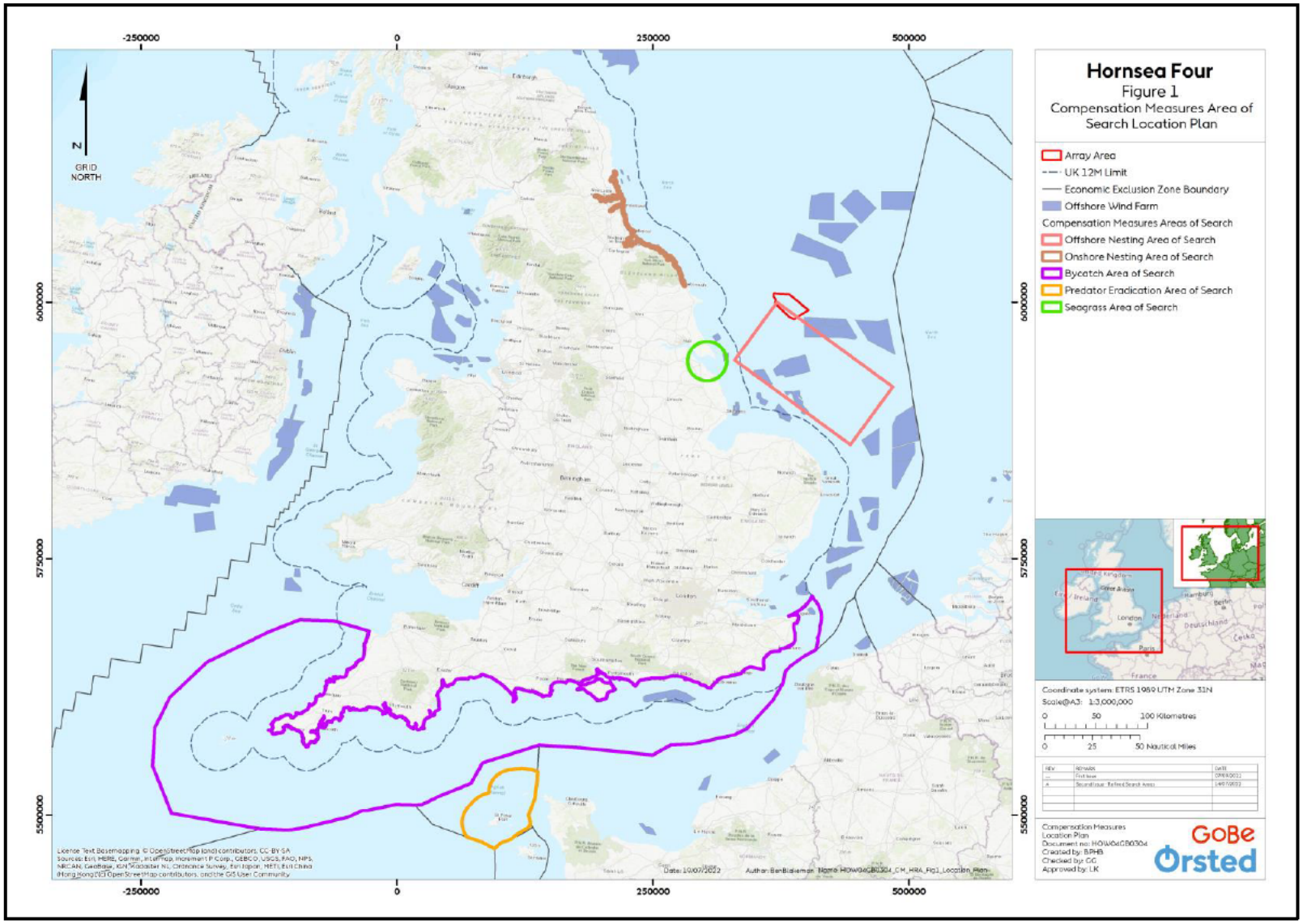

Figure 1: Location of areas of search for the Hornsea Four compensation measures.

Table 1: Compensation Measures developed by Hornsea Four for kittiwake.

Compensation Measure	Summary
Artificial Nesting Structure: Offshore	These measures would comprise of repurposing of an existing offshore structure (preferred compensation measure) or the creation of a new offshore or onshore structure to increase the annual recruitment of kittiwake into the biogeographical kittiwake population. The location would be discussed with the OOEG (see Section 1.4) prior to implementation and agreed with the Secretary of State through submission of the Kittiwake Compensation Implementation and Monitoring Plan. The implementation of the measure would be monitored, and adaptive management measures developed, if required.
Artificial Nesting Structure: Onshore	
Fish Habitat Enhancement	This resilience measure would comprise the enhancement of the chosen site (Humber Estuary), 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.

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 (TCE), East Riding of Yorkshire Council (ERYC), The Wildlife Trusts, the National Federation of Fisherman's Organisations (NFFO), the Offshore Petroleum Regulator and Environmental Decommissioning (OPRED), the North Sea Transmission Authority (NSTA) and relevant local 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 Following the DCO being granted, a Hornsea Four OOEG would be established with core members being the relevant SNCBs and the MMO/local planning authority. The RSPB and the NFFO would also be invited to form part of the OOEG, as an advisory member. The purpose of this group would be to align on detailed site selection, design, adaptive management and monitoring to inform the delivery of the compensation post consent.

1.4.1.3 The Applicant would engage with and inform (as appropriate) the OOEG at least annually in the establishment phase and as needed, and as documented in the KCIMP, throughout the monitoring period. Terms of Reference would be agreed between the parties, which would also be submitted to the Secretary of State for approval.

2 Guidance

2.1 European Commission Guidance

2.1.1.1 This Kittiwake Compensation Plan takes into consideration information from Defra 2012 Guidance[2], Defra Best Practice Guidance for developing compensatory measures in relation

[2] 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. Defra Guidance Habitats regulations assessments: protecting a European site. February 2021

to Marine Protected Areas 2021 (in consultation),[3] European Commission (EC) 2018 Managing Natura 2000 sites[4], the Planning Inspectorate's Advice Note Ten[5], precedents set by recent cases such as the Hornsea Three DCO, the principles drawn from relevant case law, and Tyldesley and Chapman's HRA Handbook[6]. The EC 2018 guidance identifies the following criteria must 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;
- 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
- The financing.

2.1.1.2 These have been addressed through the subsequent sub-headings in this Kittiwake Compensation Plan.

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 (REP5-012, REP2-005, AS-013, REP1-012, APP-171-178)** 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 may be required, it is the latter two points only which are of relevance. The evidence

[3] Best Practice guidance for developing compensatory measures in relation to Marine Protected Areas (in consultation).
[4] 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.
[5] Planning Inspectorate (2017). Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects. November 2017, Version 8.
[6] 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.

presented within this Kittiwake Compensation Plan and supporting annexes demonstrates that the proposed measure is predicted to more than offset the estimated impact of Hornsea Four wind farm on the qualifying kittiwake feature (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 biogeographical kittiwake population and thereby ensure that the coherence of the national site network is maintained. Further information to support this is provided in **B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**.

3 Onshore and Offshore Kittiwake Nesting Structure

3.1 Introduction

3.1.1.1 The compensation measure that the Applicant proposes to implement for kittiwake is the provision of an artificial nesting structure. This structure would be either the preferred option of repurposing an existing offshore structure or a new structure, either offshore or onshore. 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 an onshore or offshore nesting structure as a compensation measure for Hornsea Four. This has included the following key aspects:

- Evidencing that an artificial nesting structure is a viable solution for encouraging kittiwake population growth;
- Identifying suitable search areas for the siting of an artificial nesting structure;
- Evidencing realistic growth rates and population dynamics associated with establishing a new colony; and
- Evidence for monitoring and adaptive measures to demonstrate the long-term sustainability of the measure.

3.1.1.2 The aim of the compensation is to provide one structure that can sustain the required breeding population of kittiwake (breeding adults) as set out in **Table 2** of Revision 2 of **B2.6: Compensation measures for FFC SPA Overview** (**REP5a-001**).

3.1.1.3 This section of the Kittiwake Compensation Plan covers the intended plan for either offshore or onshore artificial nesting options due to the similarity between the implementation of both. Where differences between the offshore and onshore options exist, this is clearly noted and described.

3.1.1.4 While the following sections provide a brief overview of the evidence in support of the measures for kittiwake, to avoid repetition, a detailed overview of the evidence supporting this compensation measure is provided in the Onshore Nesting Structure Evidence Report and the Offshore Nesting Structure Evidence Report (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)**, **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**). Therefore, the evidence reports should be read alongside this Compensation Plan.

3.1.1.5 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 a seabird species in the UK 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. These topics are covered in the following sections of the report.

3.1.1.6 Should this compensation measure be deemed necessary, the next steps required to implement it by the Applicant are set out in the Onshore Artificial Nesting Roadmap and the Offshore Artificial Nesting Roadmap (Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** and Revision 5 of **B2.7.4 Compensation measures for FFC SPA: Kittiwake Onshore Artificial Nesting Roadmap** (updated revisions submitted at Deadline 7)).

3.2 Timescales for establishment of results of measure

3.2.1.1 The compensation measure comprises the delivery of one artificial nesting structure in either the offshore or onshore environment (preferred option being offshore repurposed) with each capable of supporting the number of breeding pairs of kittiwake as set out in **Table 2** of **B2.6: Compensation measures for FFC SPA Overview** (**REP5a-001**).

3.2.1.2 Based on the evidence provided in the Evidence Reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**), the Applicant will factor in an appropriate lead in time such that the compensatory measure will deliver the appropriate number of adult (breeding age) kittiwake into the biogeographical population to offset the impact, thereby maintaining the coherence of the national site network.

3.2.1.3 The Applicant has carefully considered the ecological evidence, technical delivery of compensation and held discussions with Natural England in regard to an appropriate lead in time for the compensatory measure. The Applicant has committed to implement the nesting structure three breeding seasons ahead of operation of the windfarm. Three breeding seasons is supported by Coulson's (2011) observations of the recruitment age of English breeding kittiwake where a significant proportion (26.5%) of kittiwakes were aged three when they bred for the first time. Furthermore, Section 1.9 of Natural England's final comments to BEIS on Consultation 3 of the Hornsea Three Kittiwake Compensation Plan highlighted a 3-5 year colonisation period would ensure that the compensation is functioning prior to the impact occurring.

3.2.1.4 The Policy paper 'British Energy Security Strategy'[7] (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'.

3.2.1.5 The Applicant recognises how vital it is that the compensation delivered is not only successful for Hornsea Four, but for the industry and that the progress will be watched closely. The Applicant retains its commitment to implement an artificial nesting structure three breeding seasons ahead of operation of the windfarm, as it has been argued that this balances the need to demonstrate the compensation measure will be effective with the pressing and urgent need to deliver 50GW of offshore wind energy by 2030, as set out in the British Energy Security Strategy. The Applicant does however believe that there is now a

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

strong case to be made not to include a specific timescale in the DCO ahead of operation, but rather to simply state that the artificial nesting structures should be in place prior to operation. This approach would remove this issue as an impediment to the faster deployment of offshore wind energy. The inclusion of timescales was based on previous decisions which are not binding precedent and, in the Applicant's submission, it is open to the Secretary of State, consistent with a change in policy as set out in the BESS, to remove those timescales. The Applicant urges the Secretary of State to do so.

3.2.1.6 The Applicant will continue to seek opportunities to accelerate the construction of the artificial nesting structure. It is noted that in February 2022, the UK Department of Business, Energy & Industrial Strategy (BEIS) committed to annual CfD auctions from March 2023 and Auction Round 5. Previously, CfD auctions 1 to 4 had been held on an approximate 2-year cycle. Coupled with the new 50GW target, this demonstrates the clear priority to deliver significant capacity of offshore wind by 2030.

3.2.1.7 This commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm is provided within Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** and Revision 5 of **B2.7.4 Compensation measures for FFC SPA: Kittiwake Onshore Artificial Nesting Roadmap** (both to be submitted at Deadline 7).

3.2.1.8 The Applicant has developed an artificial nest design for kittiwake which draws upon the extensive ecological evidence and associated design criteria derived from this evidence to optimise the measure (see **Figure 4** in (**B2.7.5: Compensation measures for FFC SPA Artificial Nesting Site Selection and Design (APP-191)**). Furthermore, the Applicant is also committed to developing a detailed monitoring and adaptive management plan to track the effectiveness of the artificial nests as part of the KCIMP. If it becomes clear that some of the assumptions relating to key parameters that influence the establishment of the measure are not being realised as anticipated, adaptive management measures (see **Section 3.4**) will be implemented to improve effectiveness.

3.3 Monitoring Approach

3.3.1.1 Monitoring forms an integral component of the compensatory measure and will be discussed with relevant stakeholders through the OOEG.

3.3.1.2 The implementation of the kittiwake artificial nest structure will be monitored through observations of the number of return breeding birds and their subsequent breeding success. Monitoring of these rates will follow the standard methods provided by Walsh *et al.*, (1995) and specified by the Joint Nature Conservation Committee's (JNCC) Seabird Monitoring Programme which acts as the hub of seabird population information. All relevant monitoring data collected during the project will be contributed to the JNCC's Seabird Monitoring Programme. Collection of seabird data in this format will permit comparisons to be made with on-going monitoring at existing colonies along the east coast of England, including that undertaken by the RSPB at the FFC SPA (Babcock *et al.*, 2018). In order to monitor the number of breeding birds and their breeding success whole colony counts and productivity monitoring will be conducted at the artificial nest site.

3.3.1.3 Post construction, monitoring of the artificial nesting structure will be conducted to record both breeding birds and breeding success of the first breeding season. The frequency and duration of any subsequent monitoring (while also informing adaptive management and maintenance) will be discussed in consultation with the OOEG. The precise nature of

monitoring at the structure will be influenced by the final form and location the compensation measure takes, but the intention is to predominantly carry out remote monitoring using cameras on the structure. It is noted within the relevant Evidence Reports, that the exact methods required may differ between an onshore and offshore structure, but the design of the structure will seek to incorporate monitoring whilst minimising disturbance. The frequency, duration and nature of the monitoring will be discussed with OOEG members following the Applicant's decision on the refined areas of search for the structure. Monitoring will also be undertaken at adjacent existing colonies to determine whether population trends at artificial nest structure are colony or site specific. Details on how whole colony counts and productivity monitoring will be implemented are provided in the Evidence Reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**). The details of the monitoring will be set out within the KCIMP for approval by the Secretary of State.

3.3.1.4 Monitoring of the artificial nesting structure will inform the adaptive management programme (see **Section 3.4**) and influence any potential maintenance work required on the structure (either new or repurposed). With reference to adaptive management, monitoring of breeding pairs and breeding success each breeding season will likely determine the employment of adaptive management the following season.

3.3.1.5 In addition to the monitoring of compensation effectiveness outlined above, the deployment of an artificial nesting structure (either new or repurposed) for kittiwake presents an opportunity for research. Furthermore, providing access to birds and their nests through structure design can facilitate further research opportunities, and projects to increase understanding of adult survival. Such research could help deliver some of the research opportunities identified by stakeholders through the Offshore Wind Strategic Monitoring and Research Forum (OWSMRF) (Ruffino *et al.*, 2020). Such opportunities could include the following:

- RO3.1c - Undertake targeted empirical data collection as informed by the sensitivity analyses (RO3.1b);
- RO3.3c - Deploying strategic adult kittiwake mark-recapture at multiple colonies, and analysis of re-sighting data (Re-trapping Adults for Survival (RAS) studies);
- RO3.3d - Deploying strategic chick mark-recapture at multiple colonies, and analyses of re-sighting data; and
- RO3.9b - Regional comparison of kittiwake diets during the breeding season: field studies.

3.3.1.6 Hornsea Project Three has already committed to delivering some of the OWSMRF research in relation to kittiwake diet and Hornsea Four could build on and complement this work. It is also important to note the Hornsea Four Outline Ornithological Monitoring Plan report (**F2.19: Outline Ornithological Monitoring Plan (APP-254)**) which sets out 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 kittiwake along with other seabird species (including guillemot and razorbill).

3.3.1.7 As stated above, the monitoring taken forward will be consulted on with the OOEG and detailed in the KCIMP that will be submitted for approval prior to the commencement of the authorised project.

3.4 Adaptive Management

3.4.1 Background

3.4.1.1 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. Adaptive management will be an important component of the compensation measure and will address unforeseen issues or deviations from expected time scales (i.e. colonisation rate of structure). Any adaptive measures will be thoroughly discussed and explored with relevant stakeholders as part of the OOEG prior to the implementation of any option. Further detail on each adaptive management option is presented in Evidence Report (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**). All known issues and risks will be mitigated through good design of the structure and routine maintenance.

3.4.1.2 Multiple adaptive management measures will be explored prior to the construction of the artificial nesting structure as it is important to consider the differences between intelligent structure design (which is covered in a separate section) and maintenance activity[8], and adaptive management. The site selection process gives weight on locations where productivity for kittiwake in relation to prey availability is favourable and the population is expanding to give confidence that this would not be an issue, especially in the short to medium term.

3.4.1.3 For kittiwake, acknowledging that there is natural large inter-annual variability in prey resource (forage fish recruitment), there may be short term (1-2 years) opportunities if required, to enhance the availability of prey at or adjacent to the structure (either new or repurposed) in the breeding season. This is discussed in more detail in the Evidence Reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**) and within the Supporting Evidence for Seabird Prey Resource report (**B2.6.2 Compensation Measures for FFC SPA: Prey Resource Evidence (APP-185)**) exact methods will be discussed with the OOEG. In the mid to long term, the results of diet studies together with fisheries data (Inshore Fisheries and Conservation Authorities (IFCA), International Council for the Exploration of the Sea. (ICES) etc.) could be used to inform temporary measures to increase productivity at the structure.

3.4.1.4 The data collected will be shared with relevant advisors and authorities in order to inform consideration of fisheries management by UK government if required. Any long-term challenges to the effectiveness of the artificial nest structure relating to prey resource should be viewed in a North Sea context and in the context of natural variability, climate change and other pressures. In the event that the Applicant, in consultation with the OOEG, concludes that the artificial nesting structure is ineffective in delivering compensation and after all adaptive management options relating to the performance of the structure has been exhausted, the Applicant will consult with the OOEG with the aim of identifying alternative long-term compensation measures that are securable, deliverable and proportionate to the impact on the kittiwake at FFC SPA. In such circumstances, the

[8] It is worth noting at this stage that ad-hoc maintenance, not linked to adaptive management, to the structure will also be highlighted by the monitoring plan. This will allow any remedial works or repairs to be conducted during the non-breeding season when breeding birds are not present at the structure (further information is provided in the relevant Evidence Report).

Applicant will update the KCIMP and will carry out the updated Plan as approved. Adaptive management measures are designed to support the compensation measure once functioning (post construction) as a way of furthering the success and supporting resilience of the measure (Evidence Reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**). As mentioned above, adaptive management will be linked closely to the monitoring plan, the full detail of which will be agreed through the OOEG and set out within the KCIMP.

3.4.1.5 An alternative approach than that outlined in paragraph 3.4.1.4 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 5** in relation to the option to contribute to the MRF or an equivalent fund for adaptive management.

3.4.2 Implementation Criteria

3.4.2.1 As set out in the Evidence Reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**), provision of additional artificial nesting opportunities for kittiwakes within the specified search zones is expected to enhance productivity and therefore be effective as a compensatory measure to meet Article 6(4) requirements. The establishment of breeding colonies at the structure would produce young that would become part of the wider biogeographic population of kittiwake. The success of the measure will be determined by the required number of nesting pairs breeding on the structure and productivity rate. This will be reviewed within the context of variability in breeding success and how it can be driven by external factors and therefore, success will be considered over time.

3.4.2.2 As identified at the outset of this Kittiwake Compensation Plan, it is anticipated that the Secretary of State will determine the level of effect based on the Appropriate Assessment conclusions for the potential impact of Hornsea Four on the breeding adult kittiwake associated with the FFC SPA. The Applicant's current position is the potential collision mortality effect from Hornsea Four for the project alone is predicted to be 23 individuals and it is calculated that approximately 62 additional breeding pairs will be required to compensate for the potential effect (see **B2.2: Report to Inform Appropriate Assessment (REP5-012)** and **Table 2** of Revision 2 of **B2.6 Compensation measures for FFC SPA: Overview (REP5a-001)** for further details on the predicted effects and compensation suite).

3.4.2.3 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 will be to help define appropriate and proportionate monitoring and adaptive management in relation to the compensation. A timeframe will be developed with the above considerations in mind to ensure not only that the delivery of the measure is as planned, but that relevant monitoring of kittiwake is undertaken at appropriate timescales to maximise its usefulness to the project and the wider scientific community.

3.4.2.4 In order to benefit the wider scientific community, the Applicant would look to consider collaboration on monitoring with Hornsea Three and potentially other developers who are also providing onshore nesting structures. This would maximise the usefulness of proposed monitoring programmes.

3.4.3 Site Selection

3.4.3.1 A significant amount of site selection work has already been completed for the proposed artificial nesting structure as part of the Hornsea Three compensation process (Niras, 2020). This has looked at ecological, land acquisition and technical constraints and requirements. A similar process is described in the Site Selection and Design report (**B2.7.5 Artificial Nesting: Site Selection and Design (APP-191)**; and **B2.7.3 Onshore Artificial Nesting: Ecological Evidence (APP-189)**). A summary of this work is presented below.

3.4.4 Onshore Site Selection

3.4.4.1 The Onshore Site Selection and Pathway to Securement (Niras, 2020) report undertaken for Hornsea Three resulted in the identification of two preferred search zones within which further work is being undertaken to establish a specific site on which artificial nests will be developed.

3.4.4.2 The search area, Cayton Bay to Newbiggin by the Sea is being further considered for Hornsea Four, in addition to East Suffolk, to establish a specific site on which artificial nests will be developed. The search area has been further refined through site selection and engagement with landowners and stakeholders. The areas that have been shortlisted as most suitable by the Applicant and are currently being progressed are located north of FFC SPA. In December 2021 the Applicant contacted a number of landowners to enquire if they would be interested in land purchase by the Applicant for the construction of an artificial nesting structure. Expressions of interest were received from a number of landowners and the Applicant has undertaken site visits to the areas in question to photograph and map factors such as availability of nest space in the area and the proximity of the potential land options to neighbouring nesting birds. Future work, such as progression of land agreements and permissions will be required. The constraints and requirements established as a part of the site selection process have been led by the evidence-based approach, which are described in the Ecological Evidence reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)** and **B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**). Initial consultation has been carried out and no significant obstacles to development have been identified.

3.4.4.3 A full account of the ecological criteria for the site selection process undertaken to date is provided in **B2.7.5 Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design** (**APP-191**) and an update on the site selection process is provided in the Applicant's submission to Deadline 1 at **G1.50 Compensation measures for FFC SPA: Derogation and Compensation Update Position Statement (REP1-071)**. The purpose of site selection has been to identify an area to host onshore an artificial nesting structure that will be occupied by new recruits in the English southern North Sea, whilst contributing to an increase of breeding adults to the biogeographic population.

3.4.4.4 The preferred zone for installing an onshore artificial nesting site (should it be deemed

necessary) is located within the onshore to nearshore environment and the principles influencing this initial site selection work comprise:

- Locations which kittiwake will with certainty be able to find (for example either locations where there are existing (smaller) populations of kittiwake, or where there are factors which attract kittiwake);
- Locations where there is evidence of stable/increasing productivity and evidence of on expanding population (as a proxy for favourable prey resource);
- Locations where there is a lack of existing natural or man-made suitable nesting habitat (locations where kittiwake are attempting to nest in unfavourable conditions such as ground nesting); and
- Waterfront locations away from urban housing which minimises human interaction and where purpose built onshore artificial nests can ideally overhang water, to mimic the natural nesting conditions of the target species as far as possible.

3.4.4.5 For an area of search in the onshore to nearshore environment the key steps to land acquisition have been identified below. However, in the event that voluntary agreement with the relevant landowner(s) cannot be reached, compulsory acquisition powers are available to the Applicant. Orsted Hornsea Project Three (UK) Limited advanced Phase 1 and the Applicant can therefore rely upon the draft shortlist of sites as drawn up by Orsted Hornsea Project Three (UK) Limited and focus upon Phase Two as set out below in **Figure 2**.

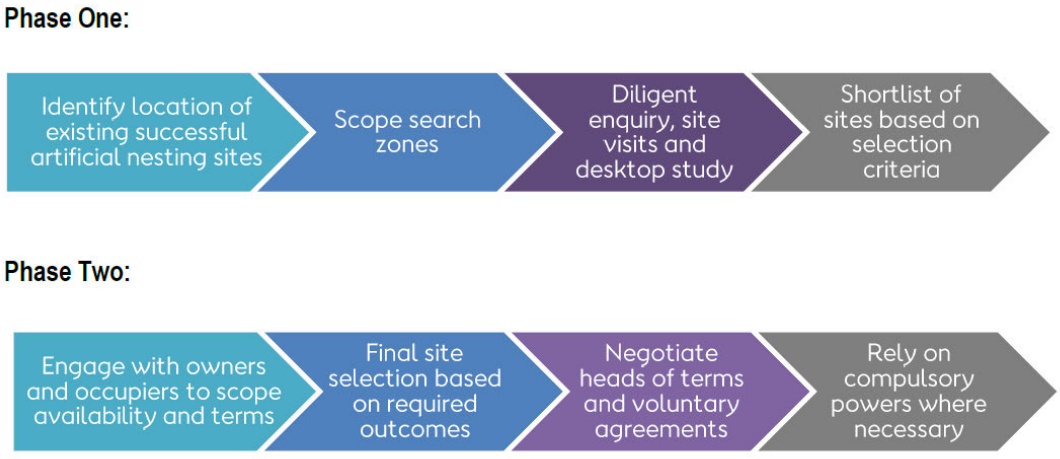

Figure 2: Phase One and Phase Two of developing a shortlist of sites for an artificial nesting structure.

3.4.4.6 The detail of the continued site selection process will be presented within the KCIMP that will be developed in consultation with relevant stakeholders (through the OOEG). Further information in relation to onshore nesting and its delivery is provided within the Onshore Artificial Nesting Roadmap (Revision 5 of **B2.7.4 Compensation measures for FFC SPA: Kittiwake Onshore Artificial Nesting Roadmap** (updated revisions submitted at Deadline 7)) and **G6.3 Kittiwake Onshore Artificial Nesting Structure Site Selection and Evidence on Nesting Limitations update** (**REP6-031**).

3.4.5 Offshore Site Selection

3.4.5.1 Offshore artificial nesting for kittiwakes is being developed for Hornsea Four, therefore no previous plans or projects have undertaken a site selection evaluation for this compensation approach.

3.4.5.2 The site selection process for the offshore artificial nesting structure is being undertaken via a heatmapping exercise. Ecological criteria is a primary consideration, with technical and commercial parameters also considered in the site selection analysis. A full account of the criteria for the site selection process undertaken to date is provided in **B2.7.5 Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design (APP-191)**.

3.4.5.3 Following the heatmapping process described above, a potential area of highest ecological opportunity measuring 140 km by 70 km has been identified. This area will be further refined following application informed by technical, environmental and commercial considerations as well as consultation with relevant stakeholders. Supporting this, geophysical surveys and geotechnical investigations will be undertaken in 2022 to inform the selection of a precise location, to ensure suitable ground conditions for construction.

3.4.5.4 Further information in relation to offshore nesting and its delivery (including maps of defined search areas) are provided within the Offshore Artificial Nesting Roadmap (Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** (updated revisions submitted at Deadline 7)).

3.5 Design and Construction

3.5.1.1 Any new structure is most likely to be bespoke or a modification to an existing building or piece of infrastructure (such as a seawall or offshore platform) which is currently colonised. The design will also vary depending on the onshore or offshore location. The onshore structure design will likely be influenced by landowner negotiations, landscape character, and existing environment of the selected location. Hornsea Four will apply the results of ongoing Hornsea Three consultation on design as a starting point, to avoid repetition.

3.5.2 Onshore Design

3.5.2.1 The Applicant is confident that there is sufficient empirical evidence of successful examples of both bespoke structures and modifications to existing structures (see Evidence Report (**B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**) that whichever solution is required it will be successful providing it meets the key design criteria, based on kittiwake ecology, as follows:

- Steep sided with a near vertical back wall and narrow horizontal ledges; Located close to water, facing out to sea (i.e. nest adjacent to/above harbour waters/sea);
- Inaccessible to predators (additional anti-predation features may be required at some sites – e.g. fences/ barriers to deter mammalian predators (e.g. foxes and rats) and dependent on design bird spikes may be required as avian predator deterrents);
- Nesting ledges located above the level of highest astronomical tide and beyond the reach of wave or tidal action;
- Adequate ledge dimensions: Horizontal ledges 20 cm width; length per pair from 30 cm (working length 40 cm); and height between ledges at a minimum of 40 cm and maximum of 60cm. (Note these may be subject to change based on feedback from the stakeholders during detailed design);

- Minimum height at which the lowest shelves should begin depends on whether the structure is located directly over water or set back slightly, as well as the level of human disturbance anticipated;
- Overhang/roof to buffer against weather conditions as to act as and additional predator deterrents;
- Vertical wall leaning slightly forward (working angle of 5°; to minimise lower ledges becoming fouled by droppings and reduce predation risk);
- Using materials which are in-keeping with the structure's surroundings whilst ensuring they meet the requirements of kittiwake's natural habitat as much as possible; and
- Higher ledges could be wider than lower ledges (to prevent lower ledges becoming fouled by droppings) (BTO Field Guide No. 23, du Feu (2015)). However, wider upper ledges may increase predation risk/ allow non target species to nest.

3.5.2.2 The Applicant will consult with the OOEG when developing the final design for the structure and draw upon the number of examples presented in the Evidence Report as well experience that will have been gained in Hornsea Three (**B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**) to ensure there is opportunity for stakeholders to feed into the process, with the final scheme set out in the KCIMP. An initial analysis which considers the different design options used at existing kittiwake examples is included in the Evidence Report (**B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**), with further information available within the Applicant's Onshore Artificial Nesting Roadmap (Revision 5 of **B2.7.4 Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap** (updated revisions submitted at Deadline 7)).

3.5.2.3 The initial structure design will allow for appropriate monitoring, adaptive management measures and any maintenance which may be required. Constructing a nesting structure which allows access to the nests would allow for enhanced monitoring and research opportunities. This information will be provided within the KCIMP, along with the evidence on which it is based. Furthermore, information in relation to health, safety and environment considerations, including health and safety during monitoring will also be provided in-line with industry standards.

3.5.3 Offshore Design

3.5.3.1 The Applicant is currently considering either construction of a new offshore structure or repurposing of an existing offshore structure, such as a platform which is due for decommissioning. Examples of ledges on offshore rigs show that they fulfil many of the natural nesting requirements for kittiwake and may provide additional benefits e.g. fewer predators and are closer to food sources (Christensen-Dalsgaard *et al.*, 2020). Further considerations for offshore nesting structure design is presented within the Applicant's **B2.7.5 Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design** (**APP-191**) and the Offshore Artificial Nesting Roadmap (Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** (updated revisions submitted at Deadline 7)).

3.5.3.2 A detailed review of onshore nest site characteristics and parameters can be found in the kittiwake compensation case produced for Hornsea Project Three (NIRAS, 2020). A summary of these key features which are equally applicable to an offshore environment include:

- High and steep sided structure, narrow horizontal ledge for nests, small overhang above nest;
- Inaccessible to predators, which offshore would primarily be large gulls;
- Some shelter from high winds and other adverse weather conditions; and
- Presence of other breeding kittiwakes (this would initially be achieved by providing decoys and playback of kittiwake calls to encourage colonization of a structure).

3.5.3.3 When adapting to an offshore environment, consideration will be taken for the wave splash zone and height above sea surface, this will be dependent on location,

3.5.3.4 At offshore sites, birds appear to choose narrow ledges under helidecks and walkways, mainly on unmanned platforms. Unmanned platforms are typically accessed infrequently, so are likely to have lower disturbance from human activity and provide some protection from predation by large gulls as the helideck forms a ceiling. However, birds also breed on manned platforms e.g. Norway and Morecambe Bay, and seem to habituate to regular human activities/presence (Christensen-Dalsgaard *et al.* 2020). The Evidence Report (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)**) provides a comprehensive overview of features of sites where birds have nested on offshore platforms. The Applicant will consult with the OOEG when developing the final design for the structure (or repurposing of existing structure) and draw upon the number of examples presented in the Evidence Report (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)**) to ensure there is opportunity for stakeholders to feed into the process, with the final scheme set out in the KCIMP. An initial analysis which considers the different design options used at existing kittiwake examples is included in the Evidence Report (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)**).

3.5.3.5 The initial structure design (or design for repurposing) will allow for appropriate monitoring, adaptive management measures and any maintenance which may be required. This information will be provided within the KCIMP, along with the evidence on which it is based. Furthermore, information in relation to health, safety and environment considerations, including health and safety during monitoring will also be provided in-line with industry standards.

3.5.4 Implementation programme

3.5.4.1 The activities required to carry out the actions set out above (which would be outlined in the KCIMP) are well understood due to the experience of Hornsea Three and extensive construction, licensing and consenting in both the offshore and onshore environment. Hornsea Four have undertaken site investigation surveys during 2022 to refine the site selection and carry out detailed design (see Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** (updated revision submitted at Deadline 7) and Revision 5 **B2.7.4 Compensation measures for FFC SPA: Kittiwake Onshore Artificial Nesting Roadmap** (updated revision submitted at Deadline 7) and **G6.3 Kittiwake Onshore Artificial nesting Structure Site Selection and Evidence on Nesting Limitations update (REP6-031)**). The Applicant would 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 KCIMP would be submitted to the Secretary of State for approval in consultation with relevant key stakeholders.

3.5.4.2 Further details on the timelines of the compensation measure are presented in the Onshore Artificial Nesting Roadmap and the Offshore Artificial Nesting Roadmap (Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap** (updated revision submitted at Deadline 7) and Revision 5 **B2.7.4 Compensation measures for FFC SPA: Kittiwake Onshore Artificial Nesting Roadmap** (updated revision submitted at Deadline 7). The Applicant has designed the compensation measures to be effective and deliverable.

4 Resilience Measures – Fish Habitat Enhancement and prey resource[9]

4.1 Introduction

4.1.1.1 Fish habitat restoration is proposed as a resilience measure to support the primary compensation measures for kittiwake, guillemot and razorbill. The habitat restored (namely, seagrass) would support a number of fish species upon which kittiwake, 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 kittiwake, guillemot and razorbill populations within the targeted area(s). This resilience measure is feasible and can be secured.

4.1.1.2 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, 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 seabird species noted above and seagrass habitat restoration methodology.

4.1.1.3 This section should also be read alongside the fish habitat enhancement roadmap (Revision 5 of **B2.8.6 Compensation measures for FFC SPA: Fish Habitat Enhancement: Roadmap** (updated revision submitted at Deadline 7)) which sets out the next steps that will be undertaken should this measure be required.

4.2 Seagrass Restoration Projects

4.2.1.1 Seagrass restoration projects have been undertaken for over 50 years (MMO, 2019). For example, in Chesapeake Bay in the US, 3,000 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).

4.2.1.2 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

[9] Hornsea Four are in the process of discussing potential seagrass restoration projects with several partners. These discussions are currently commercially sensitive, and this section will be updated in due course once further details can be disclosed.

Yorkshire Wildlife Trust are undertaking trials to discover the optimal conditions for gathering and germinating seagrass seeds (Yorkshire Wildlife Trust, 2021).

4.2.1.3 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).

4.2.1.4 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.

4.3 Seagrass Restoration Techniques

4.3.1.1 Seagrass restoration has been carried out for over 50 years and the means of doing this can principally be split into two major techniques:

- replanting; and
- reseeding.

4.3.1.2 Both techniques have their relative merits and have exhibited varying levels of success. Reseeding and replanting techniques have sometimes been used together. Using seeds 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 prior to commencement, 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).

4.3.1.3 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.

4.3.1.4 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.

4.3.1.5 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.

4.3.1.6 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.

4.4 Location

4.4.1.1 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 2 hectares of restoration will commence in 2022. Surveys are being undertaken by the University of Hull to demonstrate the connectivity of seagrass in the Humber Estuary with kittiwake prey found in the North Sea.

4.4.1.2 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.

4.5 Implementation, operation, monitoring and adaptive management

4.5.1.1 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.

4.5.1.2 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.

4.5.1.3 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.

4.5.1.4 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. **G6.6 Fish Habitat Enhancement Seagrass Restoration Implementation Study and Fish Monitoring Summary (REP6-033)** provides further details on the analysis undertaken and further survey data. Fish nursery and bird surveys have already commenced at the Humber Estuary for the Hornsea Four seagrass restoration project.

4.5.1.5 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.

4.5.1.6 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 would ensure that significant contingency, which may include reseeding/replanting, is built into the measure to provide the necessary confidence that it would 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).

4.5.1.7 Engagement with statutory and non-statutory bodies and local stakeholders and landowners would 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.

4.5.1.8 For any adaptive management locations, following site suitability surveys, a site selection process (potentially using a decision matrix) would be used to select the optimal site(s) for restoration. Environmental baseline surveys of the site(s) would be undertaken so that change over time can be assessed accordingly. Restoration of the seagrass using replanting and/ or reseeding methods would 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 would be selected to take forward.

4.5.1.9 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.

4.5.1.10 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.

4.5.1.11 The Applicant is confident that the measures extensive large-scale seagrass restoration (up to a total of 30 ha) would 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 large-scale restoration efforts.

4.5.1.12 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, 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.

4.5.1.13 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.

4.5.1.14 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.

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

4.5.1.16 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 would be an important component of the resilience measure and would be used as a method to address unforeseen issues or deviations from expected time scales (i.e. additional infill planting required).

4.6 Summary of Fish Habitat Enhancement Next Steps

4.6.1.1 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 have been conducted by OEL and SU to establish how the resilience measure could be continued and expanded to establish a large-scale restoration site in the Humber Estuary or at other sites within the UK, if required for adaptive management (see **G6.6 Fish Habitat Enhancement Seagrass Restoration Implementation Study and Fish Monitoring Summary (REP6-033)**).

4.6.1.2 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 Natural England, JNCC, the RSPB, The Wildlife Trusts, other statutory bodies and academics, and other relevant stakeholders to ensure this compensation measure is both robust and deliverable.

5 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 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;

"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 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 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.);

"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 for that purpose.

"the offshore compensation measures" means, as the context requires, bycatch reduction and/or the offshore nesting structure; and

"the onshore compensation measure" means, as the context requires, predator eradication and/or the onshore nesting structure.

2. 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—

a) terms of reference of the H4 OOEG;

b) details of the membership of the H4 OOEG which must include—

(i) the MMO and the relevant statutory nature conservation body as core members for the offshore compensation measures;

(ii) the relevant local planning authority and statutory nature conservation body as core members for the onshore compensation measures;

(iii) 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;

c) details of the proposed schedule of meetings, timetable for preparation of the KCIMP and the GRCIMP and reporting and review periods;

d) the dispute resolution mechanism and confidentiality provisions; and

e) 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 and project reviews;

g) details of any adaptive management measures, with details of the factors used to trigger any such measures;

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; and

i) provision for the undertaker to elect, subject to the approval of the Secretary of State in consultation with the H4 OOEG, 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. To the extent a fund has been established, 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 and the GRCIMP.

PART 5

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;

            1. survey methods;
            2. survey programmes;
            3. productivity rates;
            4. breeding population; and
            5. distribution of breeding birds;

        (v) recording of H4 OOEG consultations and project reviews;

        (vi) details of any adaptive management measures, with details of the factors used to trigger any such measures;

        (vii) 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;

        (viii) provision for the undertaker to elect, subject to the approval of the Secretary of State in consultation with the H4 OOEG, 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 measure 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 the 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 and project reviews;

        (v) details of any adaptive management measures and details of the factors used to trigger any such measures;

        (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 undertaker to elect, subject to the approval of the Secretary of State in consultation with the H4 OOEG, 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 reduction measure 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 the 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.

6 Funding

6.1.1.1 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 (Revision 2 of **B2.10: The Without Prejudice Derogation Funding Statement** (Deadline 7 submission)). This statement is supplemental to the Funding Statement submitted as part of the suite of Application documents (Revision 3 of **E.1.1 Funding Statement** (Deadline 7 submission)). The Without Prejudice Derogation Funding Statement outlines the overall project cost based on the capital expenditure and operational expenditure assumptions in the "BEIS Electricity Generation Costs" (BEIS, 2020). 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.

7 Conclusion

7.1.1.1 This document sets out the Compensation Plan for black-legged kittiwake *Rissa trydactyla* (kittiwake) associated with the FFC SPA. Collectively it has been termed the Kittiwake Compensation Plan. It has been developed in support of Hornsea Four should the Secretary of State agree 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 in-combination cannot be ruled out.

7.1.1.2 The compensation measure for kittiwake is the provision of an artificial nesting structure. The preferred artificial nesting structure would be an offshore repurposed existing structure, but the Applicant has also provided robust evidence as to the viability of a new offshore

structure and an onshore structure to provide reassurance to the Secretary of State (see **Section 3**). In addition, as part of the package of measures to support kittiwake (and as outlined within the Guillemot and Razorbill Compensation Plan as well), fish habitat enhancement is being undertaken within the Humber Estuary as a resilience measure. The habitat restored (namely, seagrass) would support a number of fish species upon which kittiwake (and seabirds more generally including guillemot and razorbill) target as prey resource, therefore, this measure serves as a more indirect means to offer resilience to the kittiwake population within the targeted area.

7.1.1.3 Hornsea Four are confident that the compensation measures are securable, deliverable and proportionate to the impact on the FFC SPA. The inclusion of a resilience measure provides stakeholders with additional comfort. Hornsea Four have presented detailed reviews of the evidence base supporting each of the compensation measures which can be found in the following documents: (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187), B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)** and **B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198)**).

7.1.1.4 In terms of next steps, for these compensation and resilience measures required, a Roadmap document has been produced for each measure which details the process that would be undertaken for delivery of the measure. These Roadmaps accompany the DCO application and are Revision 5 of **B2.7.2 Compensation measures for FFC SPA: Kittiwake Offshore Artificial Nesting Roadmap)** (updated revision submitted at Deadline 7) and Revision 5 of **B2.7.4 Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap** (updated revision submitted at Deadline 7) and Revision 5 of **B2.8.6 Compensation measures for FFC SPA: Fish Habitat Enhancement: Roadmap** (updated revision submitted at Deadline 7). The compensation measures are viable, effective, feasible and can be secured and delivered to successfully compensate for the potential impacts of Hornsea Four.

8 References

Babcock, M., Aitken, D., Lloyd, I., Wischnewski, S., Baker, R., Duffield, H., and Barratt, A. (2018). Flamborough and Filey Coast SPA Seabird Monitoring Programme 2018. RSPB, Sandy.

BEIS (2022) British Energy Security Strategy. Available at: https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

BEIS (2020) BEIS Electricity Generation Costs. Available at: https://www.gov.uk/government/publications/beis-electricity-generation-costs-2020

Bertelli, C.M. and Unsworth, R.K.F. (2014). Protecting the hand that feeds us: Seagrass (*Zostera marina*) serves as commercial juvenile fish habitat. *Marine Pollution Bulletin*, 83, 425-429.

Christensen-Dalsgaard, S., Langset, M., Anker-Nilssen, T. (2020). Offshore oil platforms – a breeding refuge for Norwegian Black-legged Kittiwakes *Rissa tridactyla*. *Seabird* 32, 20-32

Defra (2022). Marine Net Gain Consultation on the principles of marine net gain. Available at: https://consult.defra.gov.uk/defra-net-gain-consultation-team/consultation-on-the-principles-of-marine-net-gain/supporting_documents/Consultation%20on%20the%20Principles%20of%20Marine%20Net%20Gain.pdf [Accessed 7 June 2022].

Furness, R. & Tasker, M. 2000. Seabird-fishery interactions: quantifying the sensitivity of seabirds to reductions in sandeel abundance, and identification of key areas for sensitive seabirds in the North Sea. Marine Ecology Progress Series, 202, 253–264.

Green, A.E., Unsworth, R.K.F., Chadwick, M.A., Jones, P.J. (2021). Historical analysis exposes catastrophic seagrass loss for the United Kingdom. Frontiers in Plant Science.

Kritzer, J.P., DeLucia, M.-B., Greene, E., Shumway, C., Topolski, M.F., Thomas-Blate, J., Chiarella, L.A., Davy, K.B. and Smith, K. (2016). The Importance of Benthic Habitats for Coastal Fisheries. *BioScience*, 66, 274-284.

MMO (2019). Identifying sites suitable for marine habitat restoration or creation. A report produced for the Marine Management Organisation by ABPmer and AER, MMO Project No: 1135, February 2019, 93pp

NIRAS (2020). Orsted Report: Response to the Secretary of State's Minded to Approve Letter Annex 2 to Appendix 2 (Kittiwake Compensation Plan): Kittiwake Artificial Nest Provisioning: Ecological Evidence. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-003241-HOW03_30Sep_Appendix_2_Annex_2%20Ecological%20Evidence%20(06543000_A)%20combined%20(06543760_A).pdf

Ocean Conservation Trust, (2021). England's Largest Seagrass Planting Programme is Underway in Plymouth Sound. Accessed at: [redacted]

Orth, RJ., Lefcheck, J.S., McGlathery, K.S., Aoki, L., Luckenbach, M.W. Moore, K.A., Oreska, M.P.J., Snyder, R., Wilcox, D.J. and Lusk, B. (2020). Restoration of seagrass habitat leads to rapid recovery of coastal ecosystem services. *Science Advances*, 6(41), eabc6434.

Peters, J.R., McCloskey, R.M., Hinder, S.L. and Unsworth, R.K.F. (2015). Motile fauna of sub-tidal *Zostera marina* meadows in England and Wales. *Marine Biodiversity*, 45(4), 647-654.

Ruffino, L., Thompson, D. & O'Brien, S. (2020) JNCC Report No. 651: Black-legged kittiwake population dynamics and drivers of population change in the context of offshore wind development. Published: 2020-05-29

Stroud, D.A., Bainbridge, I.P., Maddock, A., Anthony, S., Baker, H., Buxton, N., Chambers, D., Enlander, I., Hearn, R.D., Jennings, K.R, Mavor, R., Whitehead, S. & Wilson, J.D. – on behalf of the UK SPA & Ramsar Scientific Working Group (eds). 2016. The status of UK SPAs in the 2000s: the Third Network Review. JNCC, Peterborough.

Unsworth R.K.F., Bertelli C.M., Esteban, N.E., Rees S.R. and Nuuttila H.K. (2019). Methodological trials for the restoration of the seagrass Zostera marina in SW Wales. SEACAMS Report SC2-R&D-S07.

Unsworth R.K.F. & Butterworth E. (2021). Project Seagrass - Potential sites for seagrass restoration to benefit target seabird species.

Unsworth, R.K.F., Butterworth, E., Freeman, S., Fox, E. and Priscott, K. (2021). The ecosystem service role of UK Seagrass meadows. Project Seagrass.

Unsworth, R.K., Williams, B., Jones, B.L. and Cullen-Unsworth, L.C. (2017). Rocking the boat: damage to eelgrass by swinging boat moorings. *Frontiers in Plant Science*, 8: 1309.

van Katwijk, M.M., Thorhaug, A., Marbà, N., Orth, R.J., Duarte, C.M., Kendrick, G.A., Althuizen, I.H.J., Balestri, E., Bernard, G., Cambridge, M.L., Cunha, A., Durance, C., Giesen, W., Han, Q., Hosokawa, S., Kiswara, W., Komatsu, T., Lardicci, C., Lee, K.-S., Meinesz, A., Nakaoka, M., O'Brien, K.R., Paling, E.I., Pickerell, C., Ransijn, A.M.A. and Verduin, J.J. (2016). Global analysis of seagrass restoration: the importance of large-scale planting. *Journal Of Applied Ecology*, 53(2), 567-578.

Walsh, P.M., Halley, D.J., Harris, M.P., del Nevo, A., Sim, I.M.W. & Tasker, M.L. (1995). Monitoring Handbook for Britain and Ireland. JNCC/RSPB/ITE/Seabird Group, Peterborough.

Yorkshire Wildlife Trust (2021). The climate emergency threatens our seas. Accessed at: [redacted]